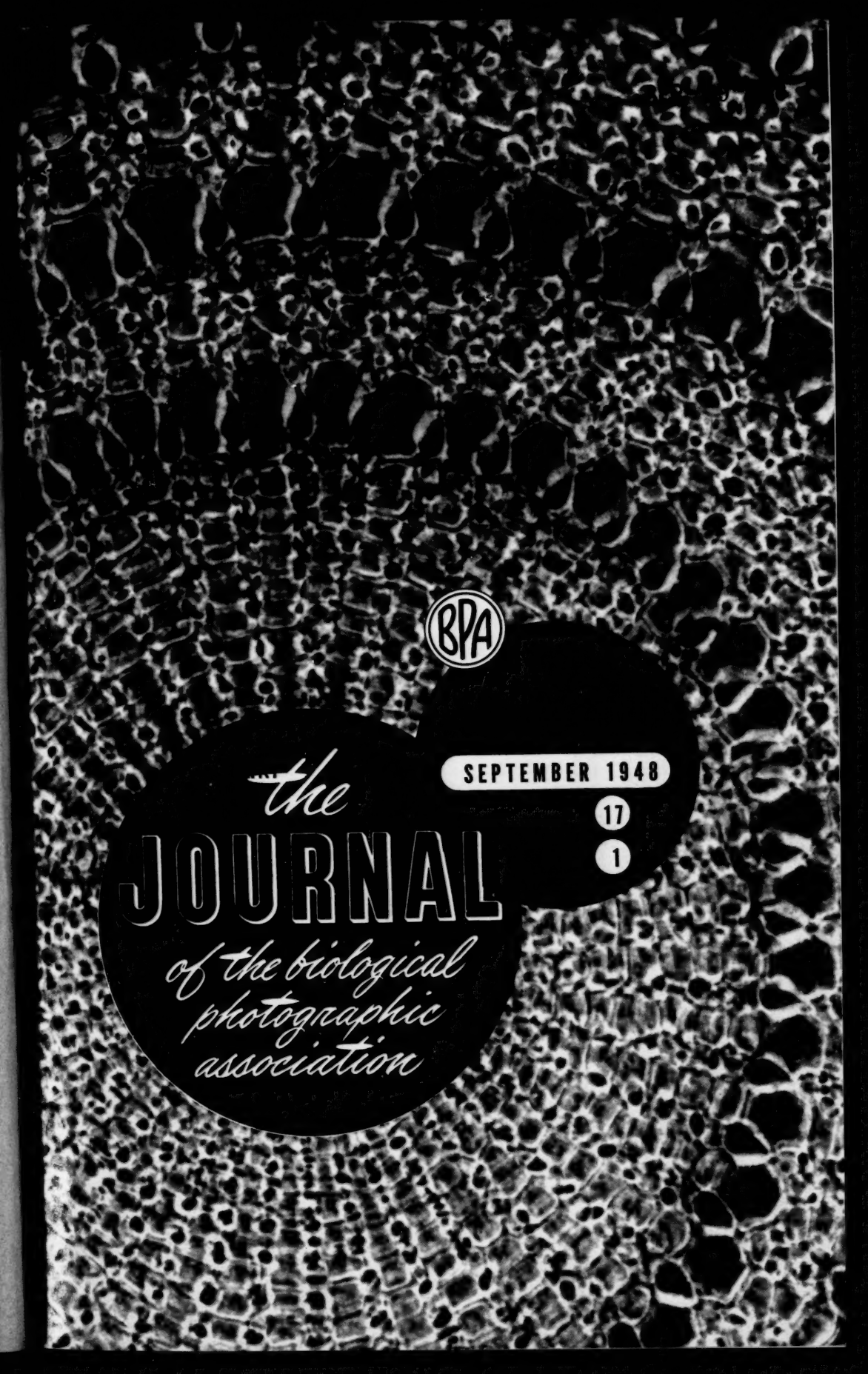

BPA
the
JOURNAL
of the biological
photographic
association
SEPTEMBER 1948
17
1

Forestry
SD
1
13613

## *New Journal Cover*

The attractive new Journal cover is composed of a photomicrograph of a spine of an echinus, a sea urchin from Panama. The color will change with each number of Volume 17.

Forestry
Farm

# The JOURNAL of the Biological Photographic Association

Forestry
SD
1
B613
vol 17-18
1948/50

Volume 17 • SEPTEMBER, 1948 • Number 1

Official Publication of the Biological Photographic Association

COPYRIGHT, 1948

## CONTENTS

Photographing Big Trees in the Smokies.....S. Glidden Baldwin, M.D. 3

The Preparation of Endoscopic Color Pictures for Use in Medical Teaching .....Paul H. Holinger, M.D., J. D. Brubaker 11

A Take-Down Sectional Viewbox for Transparencies.....John Fallon, M.D. 31

Basil B. Varian ..... 36

Chats with the Editor ..... 37

News from the Trade ..... 39

Association News ..... 43

Leo C. Massopust, Editor

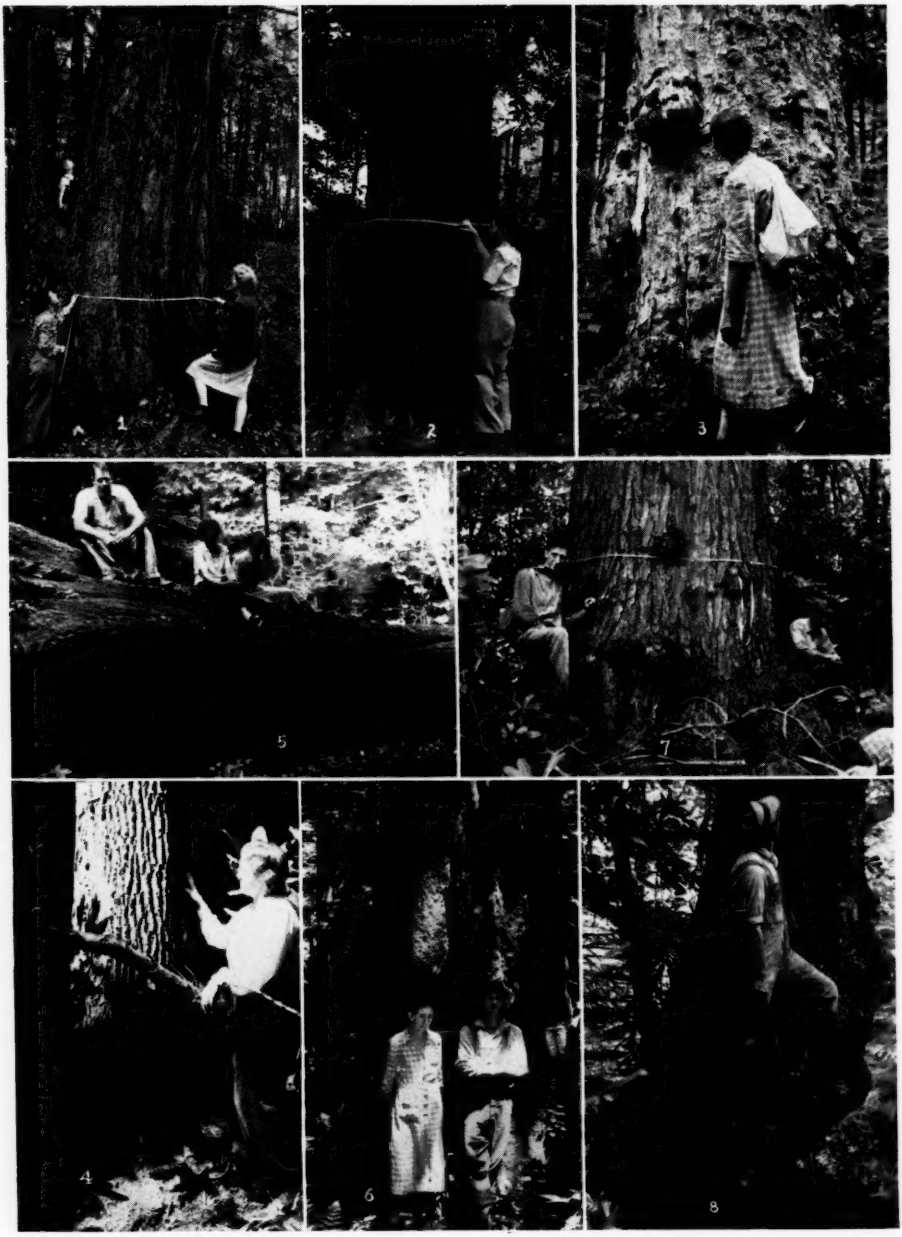
Marquette University School of Medicine

Milwaukee 3, Wisconsin

ASSOCIATE EDITORS

ARTHUR W. PROETZ, M.D., Beaumont Building, St. Louis, Mo.; ANNE SHIRAS, School of Medicine, University of Pittsburgh, Pa.; FERDINAND HARDING, The Children's Hospital, Boston, Mass.; and ARTHUR W. FUCHS, 164 Inglewood Drive, Rochester, N. Y.

Published Quarterly at 561 North 15th Street, Milwaukee 3, Wisconsin. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $5.00 per volume; foreign countries $5.50. Single copies $1.25 in U. S. A.


1
2
3
4
5
6
7
8

# Photographing Big Trees in The Smokies

**S. Glidden Baldwin, M.D.**

THE American Forestry Association maintains a continuous contest to find the largest trees of their kind in the United States. It is a sort of photographic hunting game, as it is necessary to submit pictures as well as measurements when nominating a tree for this hall of fame. A new list of big trees published in "American Forests", the magazine of the American Forestry Association, serves as a stimulus and inspiration to go out and find still larger trees.

The best hunting, according to the author, is in the Great Smoky Mountains National Park consisting of 500,000 acres located in the mountains of eastern Tennessee and western North Carolina. According to park Superintendent Mr. Blair Ross and park Naturalist Mr. Arthur Stupka, the park contains 129 species of native trees and over 1500 kinds of flowering herbs, trees and shrubs. This area has a larger flora than any similar area in the world in the north temperate zone, a real paradise for the botanist. When one considers that in England there are only 29 species of trees and all of Europe can boast of only eighty-five, then one realizes the richness of this primeval paradise — this untouched, unspoiled "bit" of native America. According to geologists the great glaciers didn't reach these mountains. They served as a reservoir to preserve our formerly rich North American flora and later as a point of dispersal for the reforestration of North America. The great amount of rainfall, suitable soil and climate and the altitudinal variations found in these great mountains favor a rich flora and account for the giants the author pictures.

Miss Florence Niedecken of Wisconsin and Gatlinburg, Tennessee, ferreted out the location of many trees from the local mountain people and with their help guided the author through beautiful cathedral-like forests to many world record trees. She reluctantly posed to show the relative size of these trees.

On one occasion Miss Niedecken was told by Sherman Clabo, an elderly resident of the Smokies, of a huge red oak which he remembered from the days years before when he pastured cattle in its shade high up above Spruce Flats. He was finally persuaded despite his age and "rheumatics" to guide Miss Niedecken there. It is a story in itself to hear of

Received for publication July 26, 1948 from 139 N. Vermilion St., Danville, Ill.

their adventures in finding the tree; when the tree was found, the reason for part of their difficulties was apparent, for it had fallen. On a second visit to photograph this fallen giant without Mr. Clabo, the author and party failed to locate the tree despite the strings Miss Niedecken had tied on the bushes to guide her on her return trip. The birds had used her strings for nesting material. A third visit guided by Mr. Clabo's son, Herbert, and his wife, Della, proved successful and the tree is pictured in this article.

On another occasion, Bill Ramsey, a fisherman and guide of local fame, bragged he could show us some "really big trees." We accepted his challenge and on a long all day hike in company with Ed Henry, another lover of big trees and an excellent woodsman and hiker, we found the largest hemlock in the world. Bill had located these trees while following bear trails to new fishing grounds. Many times our only trails were those made by these huge animals which we actually encountered more than once — who got off the trail? Just guess!

1. *All Big Trees Don't Grow In The Smokies*

   Witness the finding of this large American Elm in eastern Indiana on the Mary Gray Audubon Sanctuary property where we spent our first night with a friend and naturalist, Miss Edna Banta, (near Connersville, Ind.) This huge old monarch measured 18 feet 6 inches around 4½ feet above the ground.

2. *The Largest Hedge Post We Could Find*

   Mrs. Baldwin measured this giant Osage Orange tree (Hedge) at the Lanier home in Madison, Indiana, and found it to be 11 feet 7 inches CBH (circumference breast high). Did you ever see one larger?

3. *This World Record Yellow Buckeye*

   is to be found by "intrepid" explorers on the right side (going up) of Roaring Fork stream above Grotto Falls which is on the Trillium Gap Trail, most easily reached from the Cherokee Orchard end. Miss Niedecken led me to this tree by hopping rocks and boulders in the stream bed as she had found it on a previous expedition when exploring for a beautiful falls that was reported on this stream. She had tied her handkerchief to a small tree along the stream to mark the spot and eventually we found it. The handkerchief was retrieved and the tree photographed. This buckeye shows its age by its many burls and huge size. It measured 15 feet 11 inches in circumference 4½ feet above the ground (CBH).

4. *Mrs. Lucinda Ogle, Daughter Of "The Roamin Man Of The Mountains" Poses By The Largest Sourwod Tree In The World.*

In Gatlinburg, Tennessee, Wiley Oakley is a tradition — fisherman, and guide, and his daughter, Lucinda is an excellent companion for hunting big trees. Together with Miss Niedecken we found this largest of sourwoods at the right side of the Porter Creek bridge, above the ranger station in the Green Bried district, one of the most beautiful areas in the Smokies. This tree, while not large in comparison with tulip poplars or other larger growing trees, is fully a foot bigger around than any sourwood yet reported to the American Forestry Association in their contest for big trees.

5. *A Fallen Monarch*

A red oak of huge dimensions is pictured, with my tree hunting crew seated on top. This is the tree to which Herbert and Della Clabo led Miss Niedecken and me. This red oak measured (11 feet up from the base) about 19 feet in circumference. We couldn't measure it at 4½ feet because of its position, but it seemed to us it would measure 27 or 28 feet at that distance. Even trees grow old and insects, fungus and bacteria cause their downfall even as they do man.

6. *An Unusual Yellow Birch — Also A World Record*

Once while making an exploring trip with Miss Niedecken and Decatur Bohanan, a local resident and fisherman who regaled us with many stories while "traipsin" through the woods, I caught a glimpse across a small valley of what appeared to be a large tree. Upon closer observation with binoculars I could distinguish it as a large Yellow Birch. We slid and clambered to the other side where leaning out to greet us was this record breaking tree. Our guide mounted the side and we measured it. The circumference was 14 feet 1 inch CBH. Note the stick all mountain men carry when traveling the trails or manways — they fear the timber rattle snake and use the stick to beat the weeds in the path ahead — a good idea.

7. *Here In The Forest Primeval Stands A Giant Hemlock*

Measuring 19 feet 9 inches in circumference 4½ feet above the ground. Ed Henry, standing, and guide Bill Ramsey pose to show the tremendous girth of this tree. This tree is also the biggest of its kind and we score another world record.

9
10
12
11
13
14
15
16

8. *Moss Covered From Age, This Cucumber Magnolia Breaks Another Record*

Miss Niedecken and guide, Decature Bohanan, led us to the Boat Gunnel Flats, a happy hunting ground for big trees. This area is in the Green Brier District and was visited years ago by a naturalist, ecologist and botanist named Stanley Cain, who used to bring his Botany classes on two-week camping trips into the Smokies. His reports led the author to re-explore the area, finding this and other large trees. Stanley Cain is now a botanist with the Cranbrook Institute of Blomfield Hills, Michigan. This magnolia measured 18 feet 3½ inches and again breaks the American Forstery Association's record which was held by Stanley Cain. Now the author wonders — could this be the same tree grown larger in the past 20 years?

9. *Red Mulberry Trees Are Common But Not One This Size*

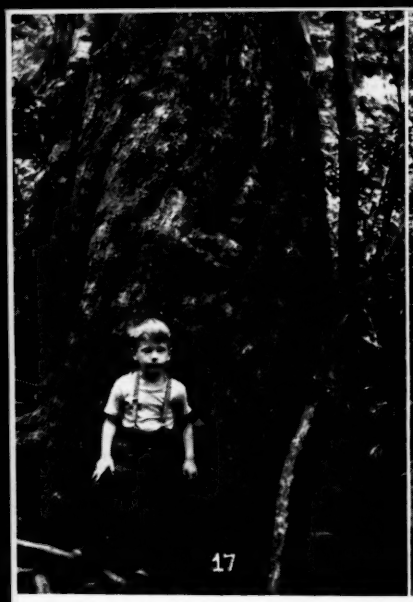
This tree found in the pasture of the Walker Sisters in the Metcalf Bottoms region of the Smokies measured 8 feet 9 inches CBH. The Walker sisters, living alone without "menfolk", typify the resourcefulness, independence, and ability of these mountain people where democracy still is cherished and individualism is still practiced and admired. Another record tree!

10. *A Small Tree Makes Headlines*

Most people think of witch hazel as a shrub. Here is a tree that measures 1 foot 5 inches CBH and stands in deep shade beside Ramsey Fork at the turn and beginning of the foot trail to Ramsey Cascades, the most beautiful waterfall in the Smokies. Picture taking is difficult in these primeval forest areas and is not made easier with newer gadgets. No one has ever reported as large a witch hazel.

11. *Mr. Arthur Stupka Preserves A Section Of This Largest of Pin Cherries*

Mr. Stupka, naturalist, of the Great Smoky Mountain National Park demonstrates his sawing technique while taking a specimen of this large pin cherry which he had reported to the American Forestry Association before it fell over in a storm. Ranger Naturalist McCamy assists with a rock wedge. This record is now open and the author plans to submit another cherry not quite as large but probably a record now. Mr. Stupka's tree was recorded at 4 feet 11 inches CBH.



17

18

19

12. *A Near Record Tulip Poplar*

Once when we were talking with fisherman Decatur Bohanan he expressed a desire to show us a large tulip, if he could find it, that had them "all beat". He said it was so large that he remembered his father rounding up his hogs in the fall and using the tree to keep them in, (it was hollow) until they could get them together to drive back down the mountain to his home. Asked how many hogs they could get into the tree he thought about fifteen. We "took him up" and one day started out and the picture proves that it wasn't another tale but the truth. This large tulip measured 23 feet 8½ inches CBH and was hollow, but still in good condition and living with a good crown. The picture shows Miss Niedecken "peering" out and Ed Henry appraising its height. The tree measured 9 feet inside diameter at the base.

13. *The 'Coon Tree — and a Remarkable Story of Saw Mill Flats*

Decatur Bohanan had reserved the best for the last. When seeing we needed a little "pepping up" to get back home he told us about the time he and his brother were 'coon hunting in these parts and how the dogs had treed two large 'coons in a certain large tulip poplar that stood on the side of the mountain close by. Well, it was getting nearly dark and the 'coons couldn't be seen up the tree so his brother decided to go home and get an axe and cut the tree down. Well, believe it or not, he got the axe and cut a lead on the side of that huge tulip. Decatur said that was just too much work and gave up and went home. His brother, dismayed, stopped chopping and lay down beside the tree until morning. When the 'coons started down he shot both of them and brought them home to show Decatur! Figure 13 shows that our guide did pep us up. We actu-

ally located the tree and he proudly pointed out the lead his brother cut on the right side of the tree. This tree was considerably decayed on the far side,—record size, but nearly dead. Just look at the diameter of it, easily 8 feet across! Again Miss Niedecken and Ed Henry do the measuring.

14. *The Devil's Walking Stick or Hercules Club*
is the name given to this tree (Aralia spinosa). It was with pride we took this picture of a tree, 2 feet ½ inch CBH, though small it is another world record tree. It stands or leans over Ramsey Fork on the opposite bank about one-fifth way up the trail to the casades from the turn-around.

15. *Mountain Maples Must Grow In The Shade On A Rock Mountain Side*
This maple is on the mountain side of the trail from Mt. LeConte Lodge to Trillium Gap about one-half way down. It leans as do most mountain maples, but is in good health and breaks the records with 3 feet CBH. It was raining when this picture was taken on the north side of the mountain — next time I'll carry a tripod.

16. *Rhannus Carolinana Is Called Southern or Carolina Buckthorn*
This small tree is generally a shrub but it occasionally reaches tree size and here the author measured it about 9½ feet CBH.

17. *My Youthful Son Reluctantly Poses By This Tree Gnarled With Age*
A red maple measuring 15 feet CBH on the Alum Cave Trail to Mt. LeConte, another trip the Park Naturalist Service sponsors and leads.

18. *A Large Tulip On The Ramsey Cascade Trail*
Nature lovers and tree admirers can't resist this beautiful old monarch. The Misses White from Illinois pause to pay their respects to this large tulip which measures 18 feet 2 inches CBH and is one of the features of the trip to Ramsey Cascade which the Park Naturalist Service offers visitors.

19. *An Unusual Tree or Trees*
This huge red maple was spied while scrambling over and under the dense undergrowth of laurel and rhododendron. A record was thought to be in the making but when measured it was found to be two trees wedded — a red maple and a hemlock. There was no division between the trees. The bark of one blended and melted into the bark of the other. The CBH, 15 feet 7 inches.

# Contributing Members

Dr. S. Glidden Baldwin
139 Vermilion Street
Danville, Illinois

Dr. Dennistoun M. Bell
"Broadview"
Amagansett, N.Y.

E. C. Baker
156 Overhill Road
Youngstown, Ohio

J. D. Brubaker
805 Greenleaf Street
Evanston, Illinois

Dr Tibor Benedek
25 E. Washington Street
Chicago 2, Illinois

Dr. W. A. "Don" Cammon
Cameron Surgical Specialty Co.
666 W. Division Street
Chicago 10, Illinois

Ralph P. Creer
American Medical Association
535 N. Dearborn Street
Chicago 10, Illinois

Dr. E. J. Farris
The Wistar Institute
Philadelphia 4, Pa.

Louis Paul Flory
Boyce Thompson Institute for
Plant Research
Yonkers 3, N.Y.

Dr. A. Wilson Footer
2828 Summit Street
Oakland 11, Calif.

Marjorie E. Francis
Visual Research Company
30 N. Dearborn St
Chicago 2, Ill.

Dr. Jay M. Garner
723 Elm Street
Winnetka, Ill.

H. Lou Gibson
Eastman Kodak Company
Rochester 4, N.Y.

Fort B. Guerin
6310 Delmar Blvd.
St. Louis, Mo.

Joseph B. Haulenbeek
30 W. Harriet Avenue
Palisade Park, N.J.

Joseph T. Jackson
Emory University Hospital
Emory University, Ga.

Victor R. Landi
8211 Grove Street
Silver Spring, Md.

Henry M. Lester
101 Park Avenue
New York 17, N.Y.

Dr. Robert Mallory III
169 Milton Road
Rye, N.Y.

Gunther E. H. Mathes
P. O. Box 324
Waterbury, Conn.

Dr. Geo. Matula
105 W. Adams St.
Chicago 3, Illinois

John A. Maurer
c/o Ansco
247 E. Ontario St.
Chicago, Ill.

Stanley J. McComb
1026 Sixth Avenue S.E
Rochester, Minnesota

Ray Miess
1810 N. Farwell Ave.
Milwaukee 2, Wis.

Leonard L. Perskie
Graphic Studios
231 - 10th Ave.
New York 11, N.Y.

Dr. Arthur W. Proetz
12 Westmoreland Place
St. Louis 8, Missouri

Frank N. Ruslander
Harper Hospital
Detroit 1, Michigan

Albert Sadler
Wayne County General Hospital
Eloise, Michigan

Dr. Florian E. Schmidt
The Armour Laboratories
1425 West 42nd Street
Chicago 9, Illinois

Anne Shiras
University Office
Magee Hospital
Pittsburgh 13, Pa.

Lloyd E. Varden
Pavelle Color, Inc.
533 West 57th Street
New York 19, N.Y

Julius Weber
425 West 263rd Street
Riverdale 63, N.Y.

# The Preparation of Endoscopic Color Pictures for Use in Medical Teaching

**Paul H. Holinger, M.D.* and J. D. Brubaker†**

ENDOSCOPIC color pictures are used in medical teaching in much the same manner as is other photographic material. They are used as lantern-slides, transparencies, paper prints, and half-tone illustrations in books and journals printed in color or black and white. Since the original pictures are too small for direct use and are surrounded by the photographed reflections of the interior of the endoscopes, they require special preparation and special conditions for their most effective use.

The purpose of this paper is to describe the methods employed to obtain the final lantern-slide or print from the original endoscope color transparencies, and to describe a system of cataloging the original films. The original transparencies are those of the larynx, bronchi, esophagus and the ear, nose, and throat taken through open-tube endoscopes by means of the Bruker-Holinger endoscopic still camera [1,2]. The originals, on 35 mm Kodachrome film may be used in several ways: (1) They may be copied and enlarged to a larger size on Kodachrome or other color film and the finished copies mounted in 2″ x 2″ or 3¼″ x 4″ lantern-slide glass for use in lantern-slide projectors. (2) Black and white negatives may be made from the original color transparency, for making paper prints. (Black and white lantern-slides may be made from these same negatives, but are of little value when compared with color transparencies). (3) Half-tone illustrations may be made from the paper prints to illustrate books or medical journals. (4) Printed color plates in books may be made from the enlarged color transparencies.

Lantern-slide projection is the most common form in which endoscopic color pictures are used. A lecture or seminar presenting case-histories involving endoscopic lesions may use lantern-slides of the ex-

Received for publication, July 28, 1948.

Presented at a meeting of the Biological Photographic Association, Rochester, N. Y., September 13, 1947. The work reported here was done under the auspices of The Jacques Holinger Memorial Fund.

* Ass't. Professor of Laryngology, Rhinology, and Otology, Univ. of Illinois College of Med., Chicago, Illinois.

† Design and Research Engineer, 805 Greenleaf St., Evanston, Illinois.

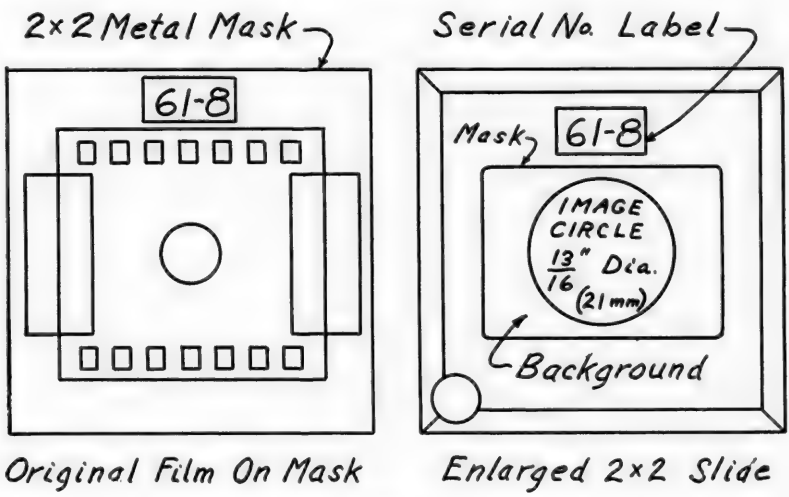



Figure 1.

ternal clinical appearance of the patient, external views during and after surgery, X-ray films, gross specimens, photomicrographs, and endoscopic views. The endoscopic pictures are often part of a well-rounded study and do not necessarily stand apart from the usual teaching material.

Enlarged transparencies mounted on light boxes are valuable as teaching exhibits.

### *Advantages of Using Duplicates*

The use of the original endoscopic photograph for projection purposes has several disadvantages. The image is usually too small for satisfactory projection, being only ¼ to ⅜ inch (6 to 10 mm) in diameter. Furthermore, the out-of-focus images reflected from the inside wall of the endoscope occupy the major portion of the film area. Finally, originals that become over-heated, scratched, or broken cannot be replaced.

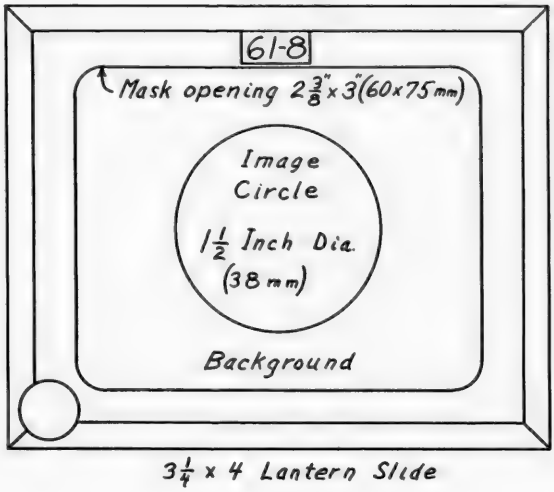
In addition to correcting these disadvantages, other advantages are gained by using duplicates. Two of the most important advantages are as follows: (1) *It is possible to correct the general density of the slide:* In the copying process minor corrections in exposure can be made, to more sharply define certain details—by means of a suitable choice of over or under exposure. The original films often are slightly flat with weak colors, due to the flat and diffuse lighting within the endoscopic passage. The contrast of the enlarged duplicate is nearly always increased, and the color saturation likewise usually is increased. While the changed color rendition sometimes exaggerates the true color seen

in the original endoscopic area, the over-all effect usually is better than the original picture taken with the endoscopic camera. Severely under-exposed films often can be copied to a more normal density, and restored to usefulness. The result is worth the effort involved, since the duplicate film often discloses important details not easily seen in the original film. The copying process can compensate for as much as one-half to one full stop of under-exposure in the original film. This permits endoscopic cameras to be designed for the maximum size image on the film with no additional allowance needed for f. stop adjustment in exposure for occasional pictures which would ordinarily require more light. (2) The second advantage: While changes in density and changes in color rendition are likely to occur simultaneously as a result of the characteristics of color film, *the possibility of correcting unwanted tints throughout the picture area is an important advantage.* Filters of the Wratten CC series may be used for this purpose. Thus a type CC-3 filter may be used in the copy camera to compensate for excessive redness caused by multiple reflections of the light within the lumen of the endoscopic passage.

## Preparation of Original Films for Copying

The process of duplication incorporates the proper masking of the film area, the choice of the most advantageous image-size on the film, and provides a satisfactory background contrast; as stated above, it permits certain minor color and density corrections in the finished pic-

Figure 2.



ture to improve its appearance. Duplicating also allows the original film to be rotated to correct for any degree of accidental tilt of the camera about the endoscope axis. The correction thus made is automatically included in all copies made from the original.

*Masking. Proper masking of the original endoscopic film area is extremely important.* The appearance of the picture is greatly enhanced by the correct size of circular mask. The proper size is that which shows a small part of the endoscope wall, giving the illusion of looking through an endoscope at the area photographed. In most instances the image of the endoscope tip is 92 to 95% of the mask diameter (figure 3). If the endoscope wall is masked off entirely, the result is not satisfactory because the image appears flat. The true general effect of masking often is not fully apparent until the finished enlarged slide is viewed on a light-box or is projected. (The effect is difficult to judge with the 7X magnifier).

Masking is accomplished by mounting the original 35 mm films on 1/16 inch (1.5mm) thick metal 24ST aluminum alloy masks, using 3/8 inch wide black cellulose-fiber slide-binding scotch tape (figure 1a, 4,8). Each film is centered in relation to the circular mask opening, using a 7 power triple-aplanat magnifier in a focusing tubular mount. Care is taken to see that the choice of mask diameter is the one most suitable for each film mounted. Before mounting, the proper mask diameter for each picture is estimated to the nearest 0.010 inch (0.25 mm). In case of doubt as to the exact size needed, several sizes are tried to observe the true effect of the change in mask diameter as seen with the 7X magnifier. Mask diameters actually used have been (inches) .250, .260, .370, .380, .390, .400, .410 etc. The mask hole is made with a boring bar with the mask clamped on a face-plate of a lathe; a drilled or reamed hole does not have a smooth enough edge.

Original mirror pictures of the larynx are mounted on metal masks and enlarged in a similar manner. Circular mask openings are suitable for some of these pictures. Others require rectangular openings for the best appearance. Full 24 x 36 mm films of gross specimens are copied with the film mounted between two masks 2 x 2 inches on the outside, with rectangular openings. The mask which forms the edge of the picture is slightly smaller than the other so that only one mask does the masking.

This mounting on metal masks is valuable in several ways: (1) The mounting without cover-glasses allows dust to be cleaned from the film just before copying. (These originals are stored in a glass sandwich made of 2 x 2 slide cover-glass, hinged with scotch tape at the top;

the sandwich is removed while copying). (2) The metal mask provides a smooth edge to the circular image even under high magnification; this is not possible with paper masks because of fibers which extend into the picture area. The back side of the metal mask is countersunk with the boring-bar tool so that the sharp edge of the circular opening is in approximate focus with the film emulsion (figure 4). (3) The mask position and size is an integral part of the original film as copied, and eliminates the need for additional circular masks on the final slide or illustration. (As previously mentioned, tilt can be corrected in mounting on the mask). (4) The top edge of the original film always can be identified by the serial number label at the top of the metal mask. This preserves the orientation of the image in permanent form, which in most films is important.

*Size of Image on Lantern-Slides*

Briefly, the problems of image size on lantern-slides are: (1) To present the endoscopic field in true natural perspective; (2) To provide a large enough picture so that all persons in the audience can see it clearly, and to provide a high enough magnification on the screen so that all significant detail in the original picture can be shown.

In practical use, a compromise must be made of these factors; a magnification must be chosen which is somewhat higher than that which represents true perspective, in order to show all fine detail clearly. Direct larynx pictures can have a higher magnification than those of the bronchi, without apparent distortion of the perspective. The most practical magnification is, roughly, that size of picture which is about two times as large as when the fine detail is just barely seen by a person with a 20-20 vision. The conditions described below approximate this requirement.

The choice of image diameters on lantern-slides is governed by the usual focal length of projection lenses used on the projectors. An image circle of 13/16 inch for 2 x 2 slides, and a 1½ inch circle for 3¼ x 4 slides are the most useful sizes (figures 1b, 2). This assumes that a projection lens of about 5 to 7½ inch focal length is used on the 2 x 2 projector, and that a lens of about 12 inch focal length is used on the 3¼ x 4 (standard) lantern-slide projector. (This assumes that the projector is located in the middle of the audience; for projection at the rear of the room, a longer focal length lens should be used).

*For satisfactory results, the numerical ratio between the image circle diameter, and focal length of the projection lens is about the same, regardless of the type of projector or size of slide used.* For example, good results can be obtained when using a 13/16 inch or one inch

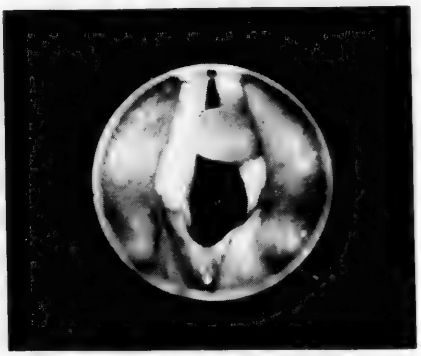


image circle in 3¼ x 4 lantern-slides when the projector is equipped with a 6 or 8 inch focal length lens.

One size of slide may be made to serve in a number of uses: (1) The pictorial catalog; (2) For projection; (3) For direct examination by individual persons or small groups of persons, with the slide on a light-box or in exhibits. (The large 1½ inch image circle in 3¼ x 4 slides is the most useful due to the greater viewing distance when used on a light-box).

Since many case-history illustrations contain X-ray films, photomicrographs, and gross specimens, and such material shows maximum detail when copied on 3¼ x 4 lantern-slides, it is desirable to have at least part of the slide catalog in the 3¼ x 4 size, in order to keep all case-history record material in one size of slide.

In order to fulfill the above requirements, the following image sizes have been chosen. The image circles of the original films are from ¼ to ⅜ inch (6 to 10mm) in diameter for pictures taken through the endoscopes. For 2 x 2 slides, these are enlarged about 2 or 3 diameters to a uniform image diameter of 13/16 inch (21 mm); this is the largest film image circle which allows a small margin between the edge of the circle and the rectangular opening (23 x 34 mm) of the 2 x 2 inch slide mask as used with 35 mm film (figure 1b). For 3¼ x 4 inch standard lantern-slides, the small original films are enlarged directly to a circular film image diameter of 1½ inches (38 mm) on type B Kodachrome sheet film (figure 2). In some cases such as the pictures of the bronchi where the perspective requires a smaller image, 13/16 inch diameter copies on 35 mm film, or 1 inch diameter copies on Bantam 828 film are bound in 3¼ x 4 glass with opaque masks which have a suitable round opening.

*Background*

It is desirable to have some illumination on the screen as a background for endoscopic pictures instead of masking off close to the image circle with an opaque mask. The pictures appear to best advantage when the circular picture area is surrounded by an area of subdued background color which is complementary to the chief color of the picture. A rough approximation of this requirement is obtained automatically in

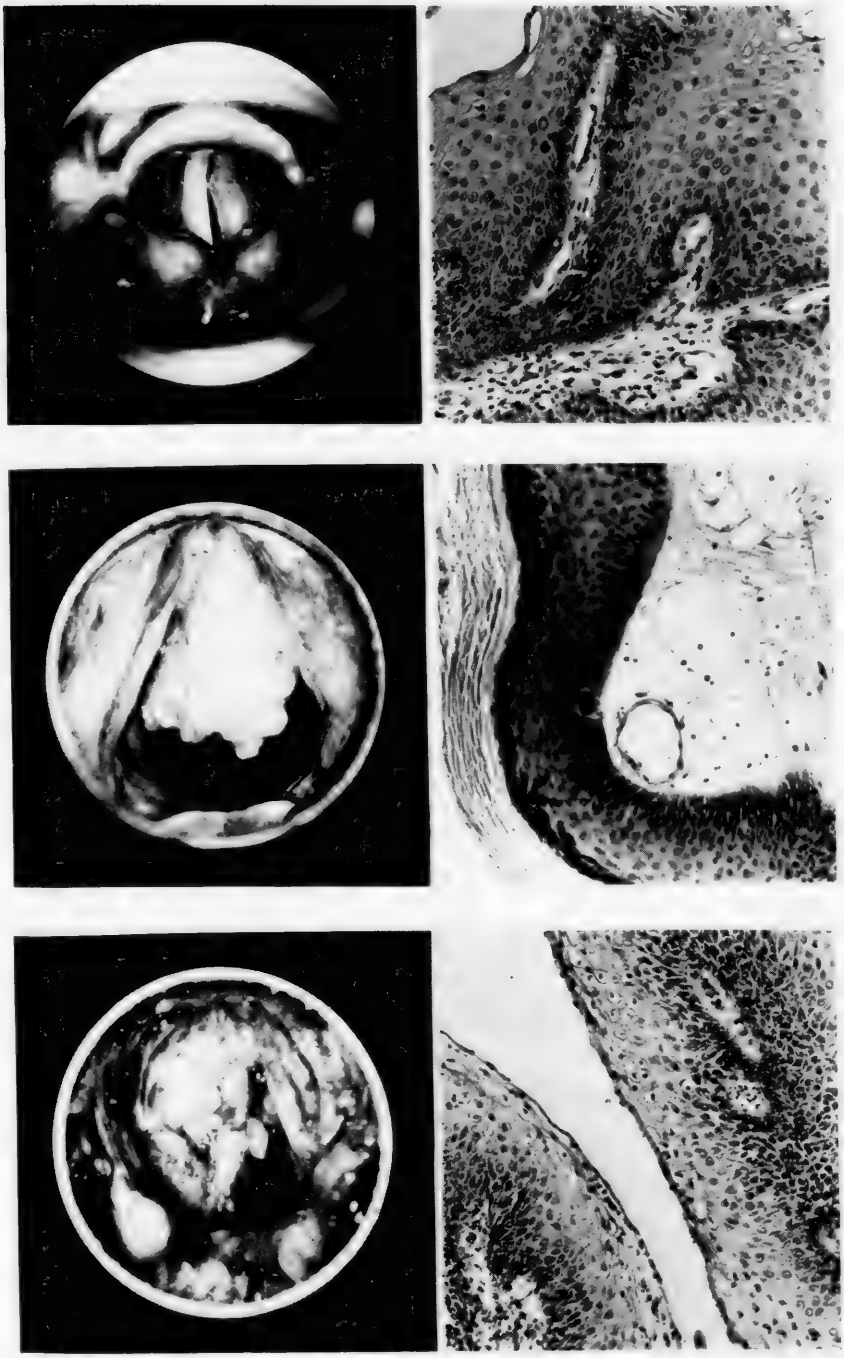


Figure 3. Two examples of properly masked pictures where the endoscope tip is 92 to 95% of the mask diameter.

a.—Film No. 66-35. Pedunculated Freely Movable Polyp of the Right Vocal Cord.

b.—Film No. 66-21. Large Papilloma Arising From the Right Vocal Cord, Anterior Commissure, and Anterior Portion of the Left Vocal Cord.

the copying process. Unexposed or weakly exposed areas of processed Kodachrome film have a relatively dark blue-green tint which for all practical purposes fulfills the above need. The circular picture is photographed into the center of the film area, and the remaining unexposed film area within the rectangular mask acts as a background of faint illumination (figure 1b,2). For 2 x 2 slides, this background area is the standard 35 mm mask (23 x 34 mm). For 3¼ x 4 slides, the most suitable rectangular background (mask size) is 2⅜ inches high by 3 inches wide (60 x 75 mm), when 1½ inch (38 mm) image circles are used. With 1 inch (25.4 mm) diameter images on Bantam 828 film, no area of suitable size is available for a background; therefore round masks of about 1-1/16 inch (27 mm) diameter are used when the films are mounted in 3¼ x 4 glass.

## The Copying Process

The copying camera used for making the enlarged duplicates was designed to permit precise calibration for duplication of exposure values on the taking film. This includes calibration for the magnification setting and means for adjusting the illumination to a recorded standard value. Precise control of the color temperature of the light reaching the film to be copied also is necessary for the best results; this is done by means of a suitable choice of lamp bulb, color-correcting filters, and by controlling the lamp voltage with a variable voltage auto-transformer (Variac) with a voltmeter at the lamp terminals. The use of a condensing system between the lamp and film to be copied was avoided because a fully diffused illumination system is necessary to keep the contrast of the duplicates down to a nearly normal value.

The apparatus used is similar to a horizontal photomicrograph camera of the low-power type. The cast-iron bed of a small Delta wood lathe (model #46-230; bed only is part #HL-600) is used as the base of the apparatus. The flat top face of the bed is 4 inches wide, with a 1¼ inch wide slot in its center. The optical center-line is 5½ inches above the top face of the bed. The various optical parts are aligned by means of tongue guides in the slot, the parts being clamped in position by ¼—20 U.S. Standard hexagon cap screws reaching through the slot to small rectangular plates underneath the slot. The plates have threaded holes and clamping is done with a wrench from the top. The total length of the base is 4 feet, but only about 3 feet is actually needed for the apparatus. The heavy lathe bed assures rigidity of the original, lens, and film in relation to each other during the exposure. A motion of .001 inch will detract from the sharpness of the image.

The components mounted on the lathe-bed base are: lamphouse, opal-glass holder with slots for 3 inch square color filters, and a standard upon which is mounted the lens and focusing stage (figures 5, 6, 7, 8).

Extension tubes or bellows make a light-tight connection from the lens to either of the special ground glass focusing cameras; one camera is for 35 mm film using a Leica box, and the other employs a Bantam (828) camera back. The film aperture of the Bantam back is notched out to provide clearance for a 1-7/32″ circle on the film. Both of these special devices are of the rotating type where the ground glass temporarily occupies the same position as the film, permitting exact focus and alignment. For larger copies on sheet film in color, and for making black and white negatives, a 4 x 5 Graflex box is used with extension tubes to increase the bellows length when necessary (figure 6-c). The image circle size for each camera is marked in pencil on its ground glass. A telescoping extension tube of variable length is used with any of the cameras; short extension tubes are added when additional length is needed.

The original film on its mask is held on the stage near the lens; the stage is moved by a knob by means of a rack and pinion, through a distance of 1¼ inches (3 cm). The original is held by two spring clips which permit moving it laterally or vertically in order to center the image on the ground glass of the camera (figure 8).

The standard upon which the lens is fixed, is always in one position, clamped down on the lathe bed. The 5 x 7 inch piece of *flashed-opal* diffusing glass is about 6 inches (15 cm) from the center of the lens, and presents an illuminated area 3 inches square toward the slide to be copied. The illuminating area of the opal glass behind the slide to be copied should cover an angle of about 45 degrees or more on each side of the center-line as viewed from the center of the slide. This wide-angle illumination will eliminate completely many of the minor mechanical defects, scratches, and the like which occur occasionally in the original films to be copied. Narrow angle illumination will accentuate the defects, and may increase the contrast of the duplicate film image.

The slide to be copied is about 2½ to 3 inches (6.4 to 7.5 cm) from the center of the lens when the higher magnifications of 2X to 6X are used (50 mm lens). The lamphouse has a 2½ inch (6.4 cm) diameter opening toward the opal glass. No condensing lens is used. The tungsten lamp is a GE type 212, 150 watt opal enlarging bulb which produces a color temperature of about 3135 K when operated at 115 volts. The lamphouse is adjustable for distance from the opal

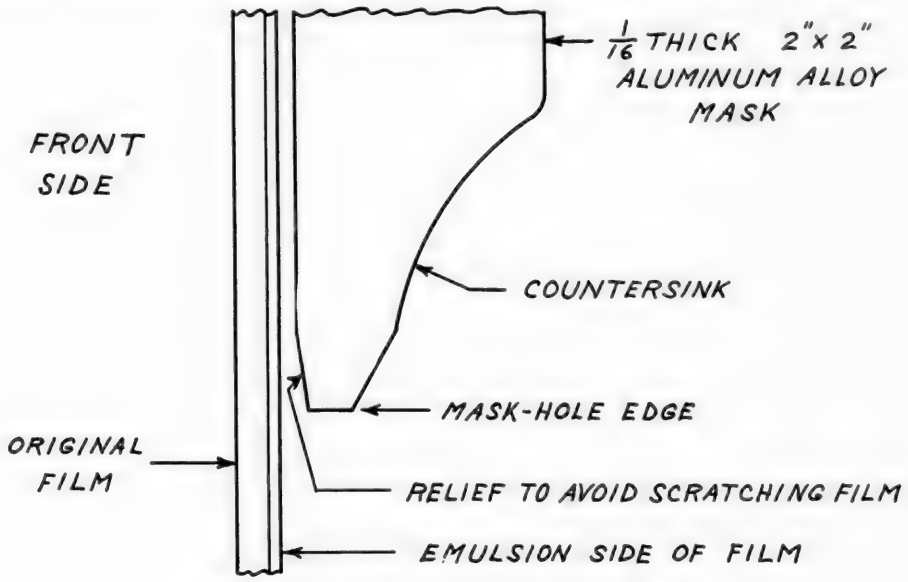



Figure 4. Sectional view of mask-hole edge.

glass in order to adjust the light intensity reaching the opal glass. Standard recorded light values of arbitrary calibration are used, calibrated by means of a General Electric Type DW-58 exposure meter with hood off, with a 5/16 inch (8mm) diameter hole mask over the photo-cell glass. Meter readings of 15 to 30 are obtained. The lamphouse is moved to bring the reading to a standard value when the meter is held against the camera side of the opal glass (the opal side of the flashed-opal glass should always be in the same direction, preferably toward the camera). This method of calibration is used regardless of whether or not color-correcting filters are used. The calibration is done at the photographing voltage of the lamp.

Eastman Wratten filters of the CC series in 3 inch square B glass are used if necessary to correct the color-temperature or to correct for unwanted tints of color in the original. A tungsten filament operated at 3200 to 3450 K color-temperature emits some ultra-violet light which may produce uncertain results when attempting color correction with filters. Loveland[5] recommends that this ultra-violet light be absorbed by a 2-A filter or some other suitable filter. The Variac variable voltage control allows the lamp voltage to be adjusted to compensate for variations in line voltage. Minor changes in color-temperature may be made by raising or lowering the lamp voltage about 10 volts.

If this is done, the lamphouse distance must be corrected to bring the light intensity at the opal glass back to the standard value.

In localities where the line-voltage fluctuates considerably, it is advisable to use an automatic voltage stabilizer such as is manufactured by the Raytheon Mfg. Co., Waltham, Mass., U.S.A. This type of voltage regulator looks like a transformer and automatically and instantaneously maintains constant the voltage output from it in spite of large fluctuations in line voltage. The stabilizer is easy to install, has no moving parts, and requires no attention after installation. The voltage delivered is constant to better than 1% (usually ½%) of a fixed value. The fixed value of output voltage can be adjusted through a short range in steps of 2 volts each when the stabilizer is installed.

In order not to change the exposure value of duplicate copies, the lamp voltage should always be within about plus or minus 2 volts of the calibrated value.

For magnifications in the range of 2X to 6X, a Leica Elmar 50 mm f. 3.5 lens is used, with the thread flange turned toward the slide to be copied, to reduce the lens aberrations. (A low-power photomicrograph lens of about the same focal length could be used in the normal manner). For magnifications between 1X and 2X, a 75 mm focal length f. 4.5 Projection Ektar precision enlarging lens is used with the flange turned toward the slide to be copied. The 75 mm lens is attached to the camera by means of a telescoping extension tube of adjustable length, instead of being fixed to the standard previously mentioned. The 50 mm lens is operated at f. 6.3 or f. 9 for color copies, and the 75 mm lens is operated at f. 11. The lenses are focused at the taking f. stop.

Kodachrome 35 mm Duplicating Type bulk film is ordinarily recommended for this work, but Type A Kodachrome 35 mm film in 20 or 36 exposure cartridges has been found to be satisfactory for making duplicates. The duplicating type of film emulsion is comparatively slow, in the same speed class as black and white positive motion picture stock—(American Standards Association film speed of roughly 1½) which requires 8 times the exposure for type A Kodachrome film. This slow film speed would require excessively long exposure times of several minutes on some slides with the present set-up, and therefore the type A film is used. (The color balance of the Duplicating Type Kodachrome is intended for use with tungsten light of 2900 degrees K.) A lamp of higher wattage would reduce the exposure time, but would also introduce additional problems of heat reaching the filters and opal glass, and color balance problems due to heat-absorbing glasses, and therefore the set-up described was used.

For copying on Kodachrome sheet film, type B Kodachrome is used. A light of 3200 K color temperature is required with this film. The 50 mm lens is used at f. 9 with a light value of about 20 at the opal glass. Exposure times are about 60 to 90 seconds for ¼ inch diameter films enlarged to 1½ inch diameter, and approximately 30 seconds for 1½ inch copies made from ⅜ inch diameter originals.

No filters are necessary for type A film if the lamp is operated at 130 volts during the exposure. (The lamp voltage is reduced to 110

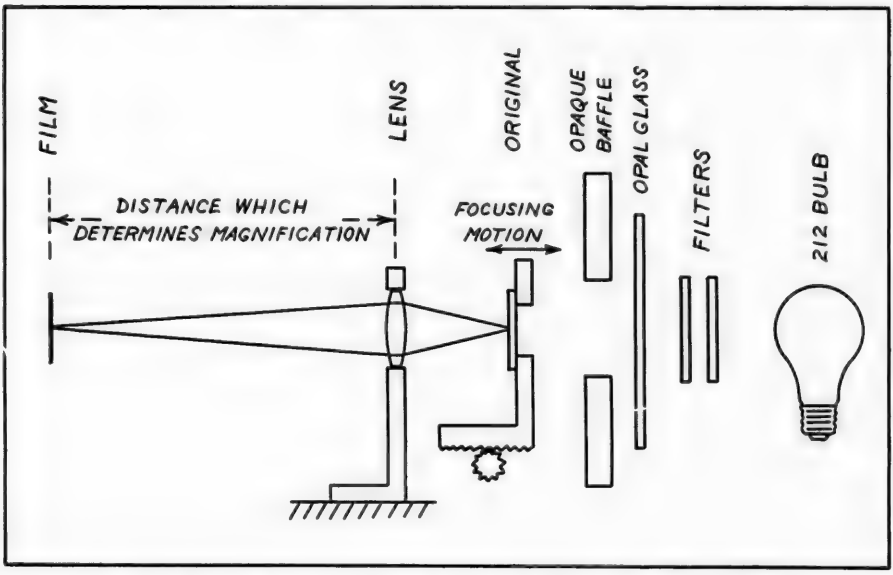



Figure 5. Basic arrangement of copying apparatus (diagrammatic).

volts for focusing). Color-correcting filters are not usually necessary with type B film when the lamp is operated at 120 to 125 volts. Some opal glass lowers the effective color-temperature slightly and requires a higher voltage on the lamp.

As previously mentioned, the magnification is controlled by the lens-to-taking-film distance, and the original slide to be copied is moved in relation to the lens in order to obtain correct focus on the ground glass in the camera (figure 5). This type of set-up is especially useful when copying at ratios near one to one. The *lens-to-taking-film distance is the magnification calibration,* and is calibrated on the apparatus base in terms of *the mask diameter* (enlarged to a 13/16 inch circle for 35 mm film, and to one inch diameter circle for Bantam 828 film). For 1½ inch diameter circles on sheet film, another series of calibra-

tions is made in the same manner. Thus three sets of magnification calibration marks are needed. In all cases, the original slide is moved in relation to the lens in order to focus; the camera is moved only to set the magnification before focusing.

With magnifications and lens arrangements which do not permit direct magnification calibrations on the base, the mask diameter of the original and the image diameter on the ground glass are measured with a scale having 1/100 inch divisions (to facilitate decimal calculations), and the ratio is recorded, such as 2.3X etc. All films of the same density will take about the same exposure when the enlargement ratio is the same, regardless of the actual image size copied.

When focusing, the opal glass is removed from the light path in order to obtain more light for focusing. *This arrangement gives adequate light for focusing and yet holds the light on the film to a low intensity (without adjusting any f. stop) to provide a convenient range of exposure times of 2 to 30 seconds.* This range of exposure times is the most convenient since they may be exposed either with a cable-release, or by means of an electrical switch connected to the lamp. The opal glass is placed in front of the seconds-timer dial so that it is not possible to forget to replace the opal glass before exposing the film. For focusing the image on the ground glass when photographing on 35 mm or Bantam (828) film, a 5 inch focal length projection lens, used as a magnifier, is mounted on a standard behind the ground glass for examining the image (figure 6a, 6b). A spacer-block keeps the magnifier to ground glass distance constant when the camera is moved. With the Graflex, for a 1½ inch circle image, a 3 power hand magnifier is used to examine part of the image. In all cases, the simplest method of focusing accurately is to pick out a very small highlight reflection in the original slide image, and focus upon it.

As previously stated, all factors are calibrated and recorded for each original copied such as: *camera extension (magnification, or mask diameter), taking-film image size, lens focal length, f. stop used, light intensity at opal glass, filters if any, film type, and lamp voltage.* This allows future duplication of exposure values without making additional test films.

With the Leica film box, using 35 mm film, the exposures are made by cable-release, with the focal-plane shutter set on "hub". When making copies with the special Bantam (828) device, the lamp switch is turned on and off to make the exposure; in this special device, there is a rotary shutter which is used as a safety dark-slide to cover the film except during the interval of actual exposure (control lever at left side,

figure 7). With the Graflex box, the lamp switch is used to make the actual exposure, the Graflex mirror being used as a safety dark-slide before and after the exposure. The focusing hood is removed to allow the use of the magnifier, and to permit direct measurements on the ground glass.

Sometimes it is found that the images on the 35 mm film are slightly too high or too low in relation to the 23 x 34 mm mask size opening for 2 x 2 slides. The image may be moved to a higher or lower position respectively on the ground glass in order to correctly center the image for use in regular Eastman 2 x 2 masks.

The room illumination is kept low to avoid diffuse light or reflections on the front face of the film being copied which would fog the image of the duplicate being made.

Previous to the actual copying, the original films (already mounted on the masks) are arranged in groups, each group being all of one mask size. Thus the camera need be set only once for each magnification. Exposure time estimates are simpler to make in groups.

When making a copy of a particular slide for the first time, the approximate exposure is estimated by comparing its density visually with a slide of about the same mask diameter for which a recorded exposure value is known. In simple cases where the time can be estimated fairly exactly, a series of 4 exposures is made (35 mm and 828 film sizes), varying by about ⅔ of a stop — 5,8,13,21 seconds etc. In those cases where it is difficult to judge the probable exposure, a series of 5 or 6 exposures is made. A series of exposures varying by ½ stop (factor of 1½) is best, but intervals of ⅔ stop (factor of 1.66) or 1 stop (factor of 2) difference are practical in many instances.

The only way to achieve first class results is to take several exposures and pick out the best one after the film is processed, since minor variations in exposure often make important changes in the general appearance of the finished film. Also, it may be found that a duplicate slightly lighter or darker than the original will have a better appearance than the original. If the additional exposures are not made, it is impossible to determine if the copy is the best that can be made. In other words, the series must go from a slight over-exposure to slight under-exposure in order to determine the exact exposure required. Experience may somewhat reduce the need for these additional exposures.

When copying on type B Kodachrome sheet film, a few trial films are taken of originals having sample densities, and the exposure is corrected upon the basis of the results of the test exposures on Ko-

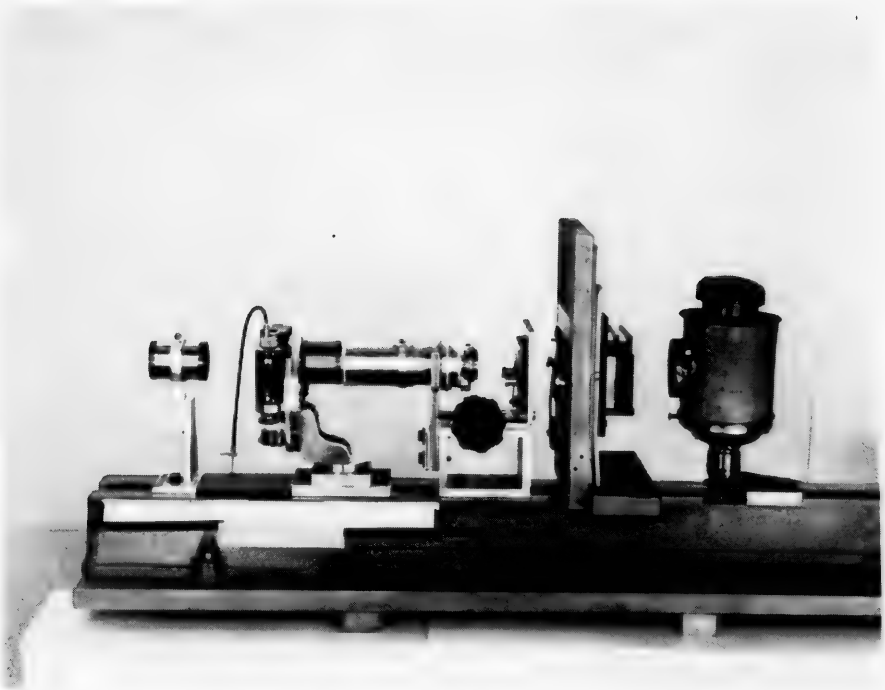


Figure 6. Copying apparatus with different cameras attached.
Figure 6a.—Special rotating ground glass focuser with Leica.

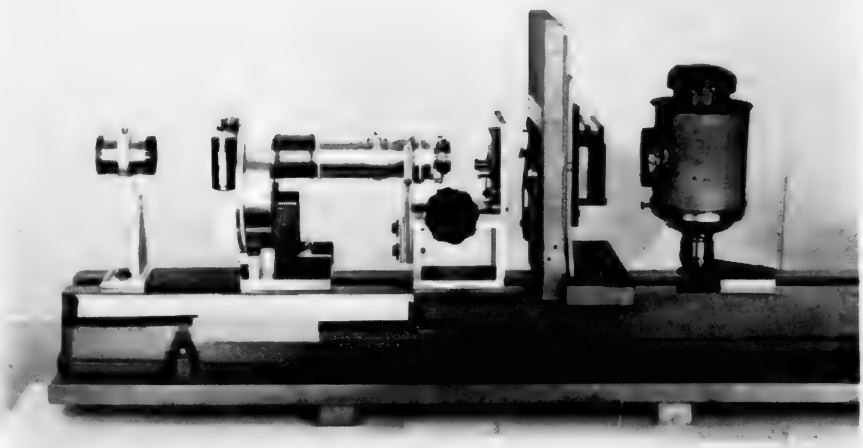


Figure 6b.—Special rotating ground glass focuser with Bantam back.

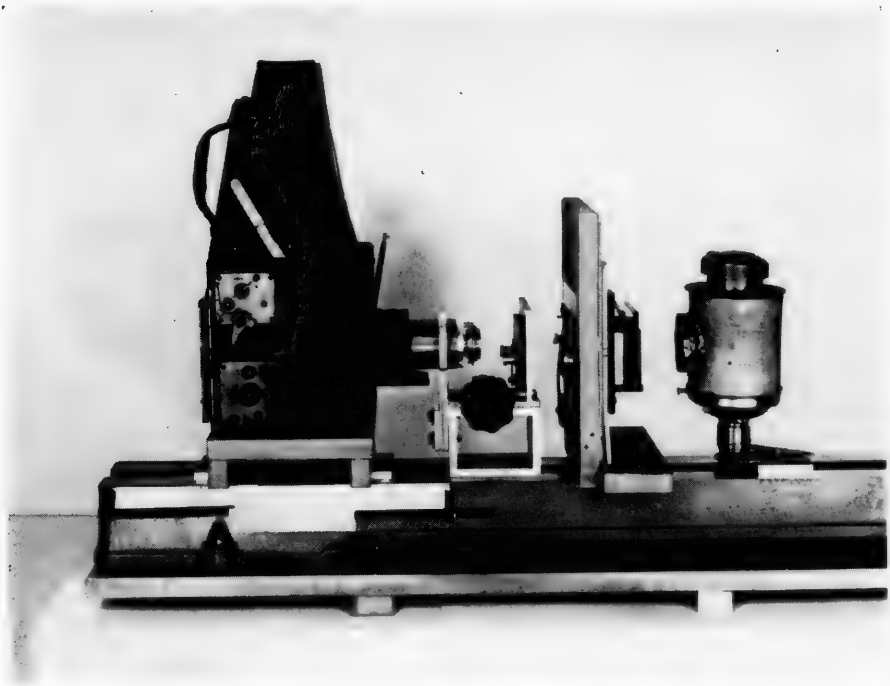


Figure 6c.—Graflex box.

dachrome film. A satisfactory method is to take two films (perhaps 15 and 30 seconds) and use the best one. In such a case, the estimated time of exposure for a perfectly exposed film was 22½ seconds. The recorded exposure times of various original films when enlarged on 35 mm film will give a close approximation as to the relative exposure times when copied on type B sheet film, since a fixed ratio can be worked out between the two different kinds of film when the other factors affecting the exposure are held constant.

## Black and White Prints

Endoscopic color pictures reproduced in black and white as lantern-slides or paper prints often are disappointing in quality—especially if the observer is accustomed to seeing endoscopic lantern slides in color. While this loss in effectiveness can be reduced by the use of color contrast filters in copying, and by some dodging when making the paper prints, there is always some loss present.

The loss in effectiveness is due to two factors: (1) Areas of color have been changed to monochrome shades of gray. Adjacent areas in

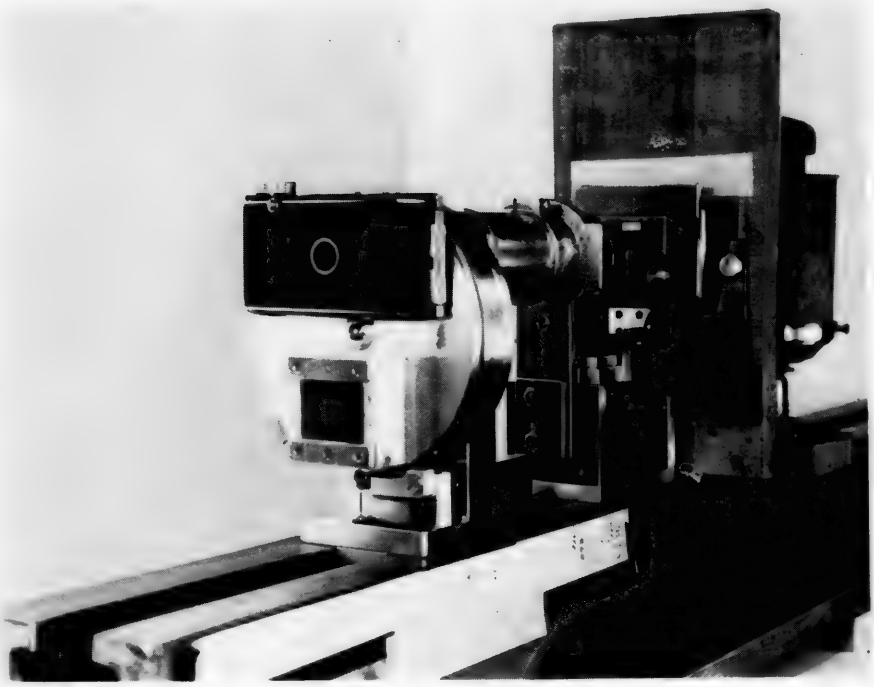


Figure 7. Rear view of Bantam focuser showing detent roller, and lever at the left which controls the rotary shutter.

the picture, of different colors, may become identical shades of gray in the black and white reproduction. (2) In the case of the paper prints or half-tones, the wide range of transmitted light intensities of the color transparency have been compressed to a shorter scale of light intensities reflected from the paper.

A convenient size of endoscopic photograph for publication is a 5 x 7 projection print with a 3 inch diameter image circle, with a black background. These are made from 1½ inch image diameter black and white negatives made with the Graflex box. The half-tone reproduction in the book or journal should be about 1½ to 2 inches in diameter. This size clearly shows most of the fine detail of the picture even though a half-tone screen is used. (See figure 3).

## Catalog Indexing System

A special catalog indexing system was developed for the endoscopic pictures discussed in this paper. It provides a flexible system which permits the addition of new slide serial-numbers in their proper place and

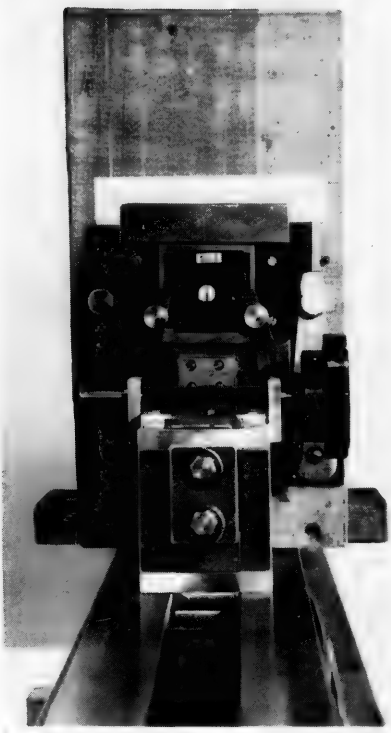


Figure 8. Close-up of original film on mask, held by spring-clips on the focusing stage. (The lens-supporting standard has been removed).

was designed so that the serial-number itself designates an approximate title for the slide. The method shown in figure 9 is used. Each original film is assigned a permanent serial-number consisting of two parts. The first part consists of two digits and designates the anatomical area and specific class of pathology present. The first digit (tens, left column of figure 9) shows the major anatomical division as set up arbitrarily for purposes of cataloging. The second digit (units, right column figure 99) designates the particular pathology for which the slide was cataloged. The two-digit number is followed by a dash and another number, the second number being the serial-number under that particular sub-division. For example, 61-8 means Direct Larynx, Normal Anatomy, slide number 8 cataloged under the subdivision of 61.

The whole serial-number appears with the original film mounted on the metal mask, on all enlarged color slides, on all black and white negatives, and on all paper prints. The number is not photographed into the picture are or background, but is attached to the top part of the slide or print outside of the projected or useful area. Thus any slide or print may be checked instantly for title classification without reference to the catalog file. The photographic exposure data used in taking the original endoscopic picture, as well as adequate patient identification data are contained in the main catalog file.

## Discussion

Accurate endoscopic color pictures are in most instances superior to artist's drawings, which of necessity are somewhat diagrammatic in order

Endoscopic Color Pictures

| | | | |
|---|---|---|---|
| 1 | Normal Anatomy | 10 | Ear |
| 2 | Foreign Bodies | 20 | Nose |
| 3 | Inflammations (non-specific) | 30 | Naso-Pharynx |
| 4 | Inflammations (specific) | 40 | Mouth and Pharynx |
| 5 | Neurogenic Lesions | 50 | Larynx (mirror) |
| 6 | Tumors (benign) | 60 | Larynx (direct) |
| 7 | Tumors (malignant) | 70 | Tracheo-Bronchial Tree |
| 8 | Trauma | 80 | Esophagus |
| 9 | Miscellaneous | 90 | Miscellaneous |

Figure 9

**CLASSIFICATION SYSTEM FOR ENDOSCOPIC FILMS**

to show the details clearly. Many artist's drawings of endoscopic views must be finished from memory or sketches. Endoscopic photographs, on the other hand, record the actual area in accurate detail with a relatively true perspective. The true appearance of endoscopic pathology may be at some variance with the usual concept of such conditions—concepts built up according to traditional artist's drawings and perhaps over-simplified word descriptions. Obviously words are inadequate, when compared with photographs, to illustrate an endoscopic view.

Endoscopic photography serves to produce a considerable number of recorded case-history illustrations showing the wide range of endoscopic appearances encountered in routine clinical practice. This gives the inexperienced student and the graduate physician an insight into the wide variations in endoscopic appearances which are seen and fully understood usually only after years of actual personal experience in the specialty.

By means of endoscopic photography, color photographs are made of the normal anatomical appearance of the passages, and of polyps, tumors, and inflammatory processes. Rare pathology also may be recorded for further study and lecture use. A study of a large series of endoscopic photographs of tumors, supports the fact in medical teaching that a biopsy must be taken to determine the final diagnosis, since benign and malignant growths often present an almost identical appearance.

## Summary

Endoscopic color pictures which are taken through open-tube endoscopes are used in many ways as a teaching medium. The small original pictures are too small for direct use as lantern-slides; enlarged copies are desirable for use in lantern slides, black and white paper prints, and for half-tone illustrations in black and white or color. Special methods are required to produce the most effective form and size of such illustra-

tions. Masking is important. Mounting the originals on metal masks has many advantages.

Much of this paper is devoted to a discussion of the methods used in enlarging the original small films to a larger size suitable for use in lantern-slides. When lantern-slides are projected, the best results are obtained with definite image sizes on the slide related to specific focal lengths of projection lenses.

Several improvements in the duplicate color picture are possible as a result of the duplicating process—the density of the slide can be changed and the color balance can be corrected.

The copying apparatus required for enlarging the Kodachrome films is comparatively simple; workable apparatus similar to that described often can be assembled from components on hand in the photographic laboratory. Much of the information on copying is of value to anyone wanting to copy Kodachrome slides to Kodachrome slides of any size.

An indexing system is shown in which the serial number itself indicates an approximate title.

Specific ways are mentioned in which endoscopic illustrative material fits into the teaching program. The general importance of endoscopic photographs in color (as contrasted with artists drawings) is discussed briefly.

## References

1. Brubaker, J. D., and Holinger, P. H.: An Endoscopic Color Camera for Otolaryngology and Broncho-esophagology. J. Biol. Phot. Assn. 15:73 (Dec.) 1946.

2. Holinger, P. H., Andrews Jr., A. H., Anison, G. C., and Johnston, K. C.: PATHOLOGY OF THE LARYNX A Photographic Analysis. Annals of Otology, Rhinology and Laryngology, 56:583 (Sept.) 1947.

3. McComb, S. J.: Duplicating Color Slides. J. Biol. Phot. Assn. 9:210 (June) 1941.

4. Wald, D. J.: Reduction Kodachrome Copies of Kodachrome Originals. J. Biol. Phot. Assn. 12:55 (Dec.) 1943.

5. Loveland, R. P.: Kodachrome Photomicrography of Stained Slides. J. Biol. Phot. Assn. 12:143 (June) 1944. (This article contains a fairly complete analysis of how to obtain proper color balance of light with Kodachrome film.)

6. Principles of Photographic Copying—Part Two: Colored Originals. Radiography and Clinical Photography 19:70 (1943) (Pub. by Eastman Kodak Co.)

7. Obtaining Black-and White Prints from Kodachrome Transparencies. Radiography and Clinical Photography 21:40 (1945) (Pub. by Eastman Kodak Co.)

# A Take-Down, Sectional Viewbox For Transparencies

**John Fallon, M.D.**

THIS viewbox was designed to facilitate rotation of displays and to lighten shipping problems. Rotation and shipping are a greater burden upon the photographic museum[1,2,3] than upon the ordinary museum composed of gross specimens: rotation, because the photographic variety, being the most compressible of museums, is likely to be so compressed that it must either rotate or stagnate; shipping, because the photographic museum is especially adapted to reach out beyond its doorstep by sending material away to meetings where men in private practice, who may not have time to go to museums, may shares its riches.

The viewbox, like a sectional bookcase, is assembled to the desired width and height from fitted units. The top and bottom edges of each unit are rabbeted to match others. If the rabbeting is carefully matched, an assembly up to ten units high is stable enough for ordinary purposes but further rigidity is added by inter-unit bolts inside each end. To save time and tools in assembling, wing nuts are used for these bolts. The members of each individual unit are joined by rabbet, screws and bolts so that the unit itself can be collapsed for storage or shipping. So far we have not found this worth doing but it might prove helpful in larger museums.

There are four different units: light box, top, small base, large base. The small base ordinarily is used for exhibits at home. The large base provides storage space and a counter for use away from the museum. Bases and tops have large openings to allow air circulation. The updraft through an assembled case, caused by the heat of the bulbs themselves, is enough to protect transparencies against overheating under ordinary conditions. However we have provided some tops with horizontal fans to give forced draft in the stuffy, crowded quarters which are encountered at some meetings.

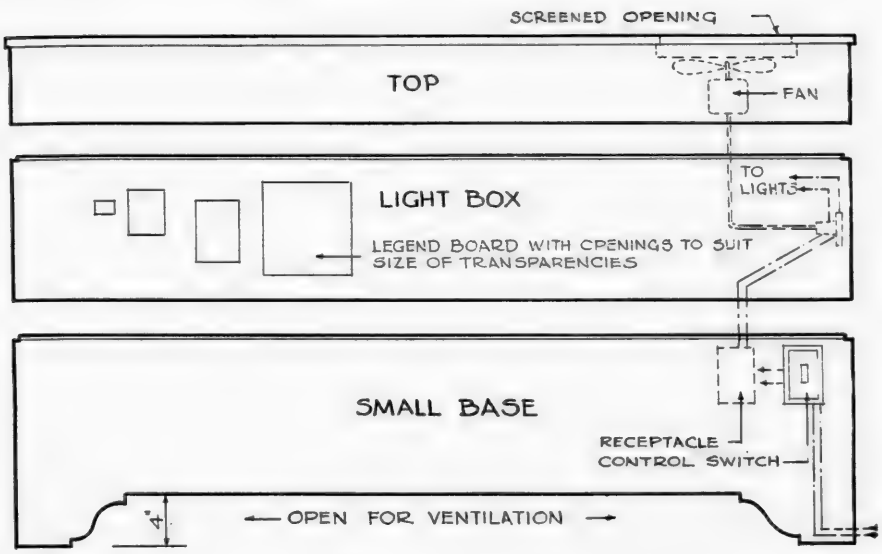
To fit into the space allotted at some meetings, all units are made 5 feet 6 inches long. Each lightbox unit is one foot high and one foot deep and consists of back, ends and a marginal frame on the front; there is no top or bottom. To the marginal front frame attaches a front

Received for publication June 21, 1948 from the Fallon Clinic, Worcester, Mass.

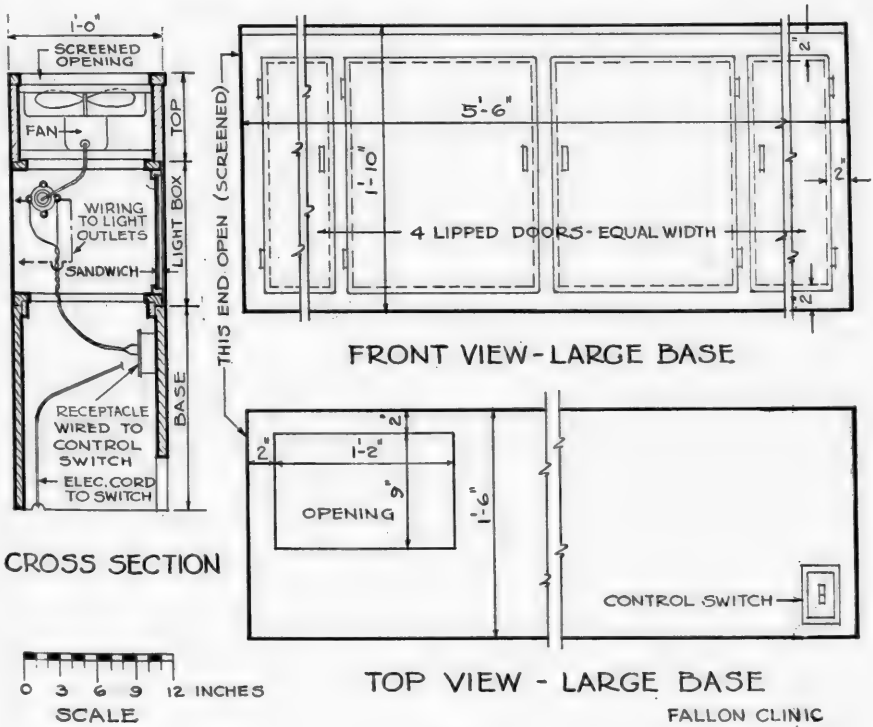
panel consisting of "sandwich" and legend-board. The sandwich is a long single sheet of opal glass in the back, upon which the transparencies are mounted by cellophane tape, and a similar sheet of clear glass in front, all held in a small wooden frame. We have tried individual sandwiches with glass backs and cellophane fronts for each picture and have found that all glass and the long sheets are handier. The sandwich is bolted to the legend-board, of composition wood, which is individually windowed and lettered for each series of transparencies. The legend-board screws to the marginal frame of the lightbox. Thus, any front panel, sandwich and legend-board together, can easily be removed, stored and replaced by another on the same back unit. For transpar-

Fig. 1. One typical assembly, partly disassembled.

**Viewbox for Transparencies**




ELEVATION OF ASSEMBLED VIEWBOX



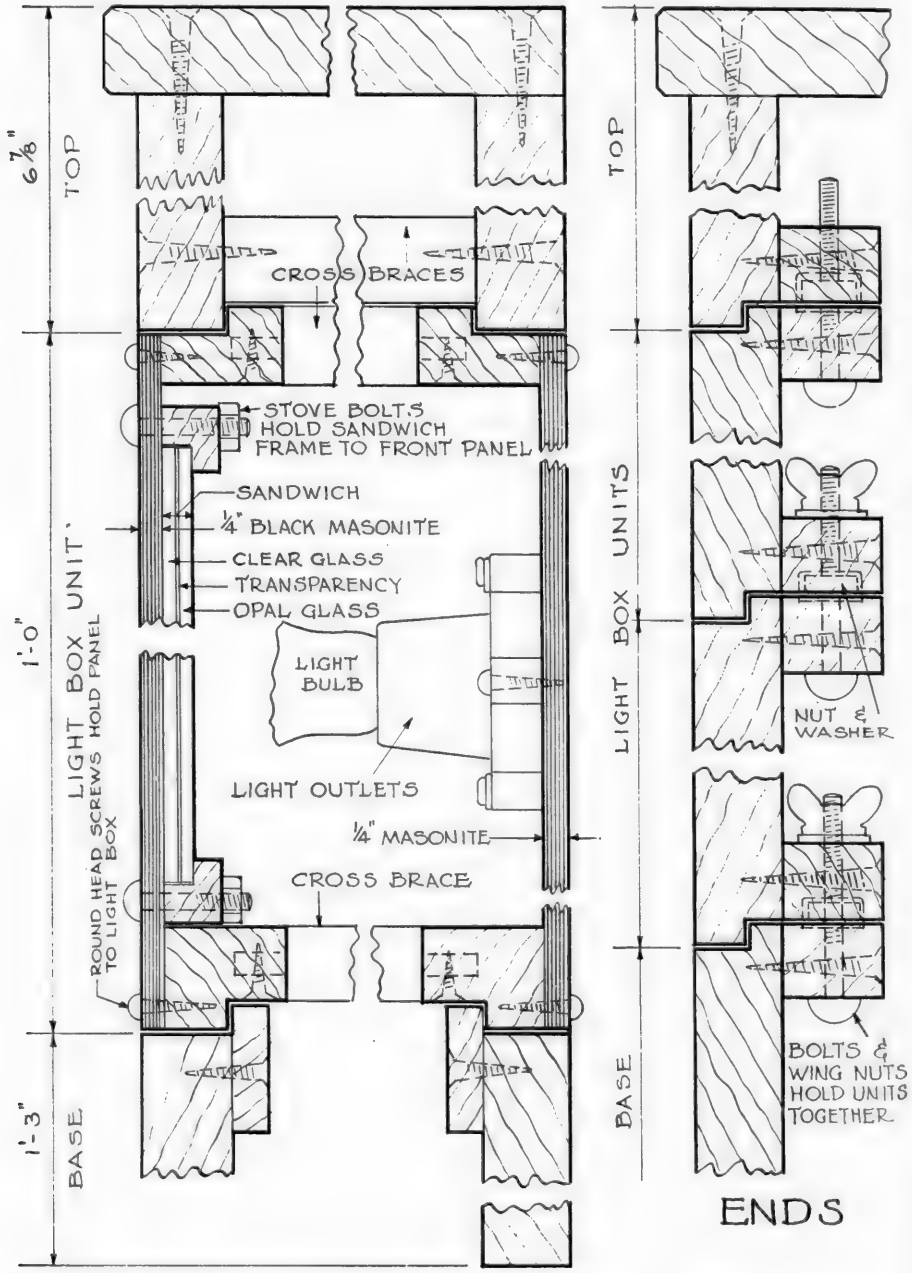

CROSS SECTION

FRONT VIEW - LARGE BASE

TOP VIEW - LARGE BASE

0 3 6 9 12 INCHES
SCALE

FALLON CLINIC




CONSTRUCTION DETAILS

FALLON CLINIC

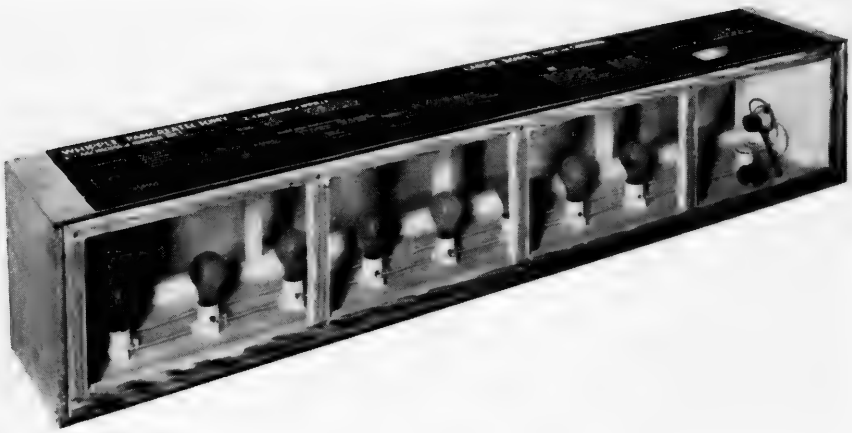


Fig. 2. The light box unit.

encies or transilluminated charts more than 9 inches high, front panels 2 or more units tall can be mounted on 2 or more back units.

When a front panel is stored or shipped one should protect the face of the legend-board. Scraping spoils the lettering.

Short lengths of wire with ordinary plug and socket connectors feed current from each unit to the next. Each light box has sockets enough so that bulbs can be placed exactly in the desired locations. Usually 5 or 6 40-watt bulbs will satisfactorily light an assembly of 3 light-boxes: the interior finish of white enamel distributes the light. However some of our base and lightbox units are equipped with wire heavy enough to carry current for lighting all bulbs at once in an ordinary 5 or 6 unit assembly. The current draw of so many bulbs introduces a fire hazard not only in the viewbox itself but in the whole circuit from which current is drawn. If more than 500 watts are to be drawn, special wire and fuses and extra circuits may be needed. An electrician should be consulted.

If frequent shipping is expected, fitted shipping boxes are helpful. Each box can hold top, base and 3 or 4 lightbox units and should be a little oversize so that chocks can hold the units away from each other and the inside of the box.

REFERENCES

1. Anon.: Color in medical photography. Pamphlet, pp. 7, Worcester, Mass., Fallon Clinic, n.d. (1939).

2. Fallon, J., Brosnan, J. T. and Moran, W. G.: The doctor as photographer. Pamphlet, pp. 15, Worcester, Mass., Fallon Clinic, 1940.

3. Fallon, J. and Meyers, J.: The photographic museum. (Ms.: In print, New England Journ. Med.)

# Basil B. Varian
## 1902 - 1948

Basil B. Varian, photographer in the Department of Anatomy, University of Pennsylvania, died on May 31 from a heart ailment, after an illness of only four days. Born in Minneapolis, he went to the University of Pennsylvania in 1922, after receiving his training as an histological technician at Columbia University under Madame Dantchakoff, famous Russian histologist. Although a highly skilled technician, he became interested in photography as well, and gradually took over the increasing work of the department in that field.

He joined the BPA in 1944 and attended our meetings regularly thereafter. In 1947 he was Chairman of the Nominating Committee. As Co-Chairman of the Salon Committee in 1948, he had already done much of the preliminary work on our exhibit at the time of his death. His own pictures were well-known to our Salon visitors, as he was a yearly contributor throughout his membership. Although photomicrography was his specialty, the excellent quality of his work in the whole field of medical photography is shown by the fact that a gross specimen and an X-ray reproduction taken by him were the two pictures chosen as the frontispiece to our catalogue for the First International Exhibition of Biological Photography in 1947.

He is survived by his wife, Dorothea Morris, a registered nurse, and by a son, Basil, Jr., from a previous marriage.

---

## BPA Local Chapter Secretaries

| | |
|---|---|
| Boston | Laurence B. Brown<br>Harvard Dental School<br>188 Longwood Avenue<br>Boston 15, Mass. |
| Chicago | Maria Elsasser Ikenberg<br>832 Gunnison Street<br>Chicago 40, Ill. |
| Cleveland | Fred S. Beal<br>St. Luke's Hospital<br>Cleveland 4, Ohio |
| Los Angeles | Avis Gregersen<br>Department of Dermatology<br>Southern California School of Medicine<br>Los Angeles 33, Calif. |

# CHATS WITH THE EDITOR

Following his recent tour of medical illustration departments in the United States, *Dr. Peter Hansell* of the Department of Medical Photography, Westminster Hospital, London, writes as follows:

"Through the medium of your Journal, I would be most grateful for an opportunity to send my greetings and sincere thanks to fellow members of the B.P.A. and to the many others who helped to make my stay in the United States so pleasant and so instructive.

"Throughout my entire visit, I encountered nothing but friendliness, encouragement and help; and it was of added interest to me to meet personally the many people who are regrettably known to us in Britain only as names beneath excellent photographs and work.

"Though I learned a great deal during my short stay with you, I would prefer to think that this was in terms of detail only, for it seems that the broader principles and aims for which we are working are parallel in the two countries. For this reason, it is to be hoped that the future will see a greater exchange of news and ideas between your organizations and those in Britain; namely, the Medical Groups of the Royal Photographic Society and the Institute of British Photographers.

"In this way we may more easily keep abreast of current trends and developments and hence more readily advance the whole field of medical photography."

Dr. Hansell's visit with B.P.A. members in the United States was welcomed by all,—our pleasure in meeting him equaled his gratitude in meeting us.

*Albert Sadler,* F.B.P.A., who spent the spring of 1948 in England, has sent in the following open letter:

"To BPA Members: The food situation in England is improving but the food-supply is far from plentiful and diets are monotonous. Points are required for most items which are unrationed, and inasmuch as points are needed for basic foods, there are none to spare for luxuries or for variety.

"Clothing is strictly rationed, and *all* clothing is included, not just outer garments. It is difficult for a person to get enough clothing on

rations to adequately clothe himself. As you know, most of England's production is exported.

"I urge you to send packages of food and used clothing to individual friends and relatives in England. If you have none, then send a package to a designated person through the agency of an English organization, e.g., your church, your fraternal order, a town council. A designated person could well be someone having your own surname, or a fellow photographer. Especially convenient is the CARE service, which will deliver a package to any person of your choice for $10. If you know no one, they will find someone who meets your description.

"Items most needed: fat, rice, dried fruits, pudding mix, canned meat, dried or canned soup, chocolate, soap, toilet tissue, and all kinds of clothing and shoes.

"Medical Photography in England is well established, and there are groups within the R.P.S. and I.B.P. The latter's certificate may eventually become a prerequisite to employment as a medical photographer.

"I spent the better part of a day at St. Bartholomew's Hospital in London with their chief photographer, Norman K. Harrison, who is a BPA member. In view of the great shortage of equipment and material, he and the other English workers find the going somewhat difficult, but manage to produce good work. They look to the U. S. for new ideas in our field, and think our Journal a valuable publication. Defense regulations make it difficult for them to receive American photographic magazines by subscription, so there is a dearth of our publications.

"I urge American photographers to send magazines to English photographers. Particularly needed are 'Medical Radiography and Photography' and 'American Photography' for professionals, and such magazines as 'Popular Photography' and 'Minicam' for amateurs. Back issues of these magazines could be sent to BPA members in England and/or to the medical and pictorial divisions of the RPS. This society will distribute them to individuals who will make good use of them."

---

## "NOOKY" For Sale

An extension lens tube for the rangefinder and viewfinder on the LEICA cameras. Automatic compensating mechanism for the Summar or Hektor 5 cm lens. For price and further information, write Dr. J. P. O'Hare, 520 Commonwealth Avenue, Boston 15, Mass.

# News From The Trade

## ANSCO COLOR DENSITOMETER

A new machine which can tell blue from blue and red from red has been developed by scientists working in Binghamton, N.Y.

An electronic color analyzer so sensitive that it will detect color differences too small to be seen by the average human eye was announced by the Ansco Division of the General Aniline and Film Corporation. The instrument can measure 1/100,000,000 of the light emitted by an automobile headlamp.

Production of Ansco Color Film for the armed forces prompted the need for such a device back in 1943, and it is expected to play an important part in cancer research on the basis of recent studies which indicate that blood changes color during progression of the disease.

Although designed primarily for photographic work, the instrument, known as the Ansco Color Densitometer, can be adapted to scores of other uses in many other fields such as measuring or matching colors in textiles, paints and dyes, and in medical research. This is the first instrument sufficiently versatile to cover all these fields satisfactorily in addition to photographic applications.

The device has the appearance of an over-sized record player with the movable arm containing an electron-multiplier phototube which provides the instrument with its high degree of sensitivity. The instrument is slightly longer than the original Ansco densitometers designed solely for black and white photography.

The present design, which provides for accurate measurement of color densities at single wave lengths (blue, green, red) as well as black and white densities of transmission as low as one part in a million, employs a new patented logarithmic electronic circuit.

This, combined with the recently developed electron-multiplier phototube, makes the device a precise direct-reading photometer of extremely high sensitivity. "The novel circuit designed by Ansco provides such sensitivity that only one microlumen is required to produce a full scale reading on the large and uniformly calibrated scale. This high sensitivity also permits the use of extremely small apertures, such as are used for micro-densitometry, and also provides the sensitivity required to measure color densities up to 3.0 and higher with the standard 3 mm aperture plate. Sharp cutting filters transmitting at 436 millimicrons, at 546 and 644 millimicrons are housed in the measuring arm. Black-and-white densities up to 6.0 may be measured by merely rotating the filter selector knob.

The instrument is said to be accurate to approximately 0.02 over the entire density range. The desired stability is secured by the use of a dynode voltage feed back circuit.

As initially designed, the Ansco Color Densitometer enables measurement of transmission densities. However, a reflection head accessory will permit the determination of black-and-white and color reflection densities of photographic papers, fabrics, pigments, drawings, etc. Another accessory simpifies the measurement of color and density of liquid solutions (and thereby the dye concentration) by methods of abridged colorimetry. The 11-inch measuring arm enables full coverage of up to 22-inch width material. The measuring arm may also be detached from the instrument and used up to six feet from the instrument proper for measuring lower light levels than it has even been commercially practical to measure heretofore. Standard recording milliameters may be used in conjunction with the instrument to obtain a continuous density record having linear density scale recording without necessitating any circuit changes.

Standard electronic tubes and standard components have been used throughout the circuit, thus avoiding the necessity for individually calibrated scales, pre-aged tubes, or preselected and calibrated elements. Replacement problems occasioning servicing delays are thus virtually eliminated.

No time is wasted in operation waiting for the new meter pointer to come to rest since the response of the electrical circuit is practically instantaneous and the meter is free from oscillation at all parts of the scale.

Room illumination has no effect on the instrument's operation, thus subdued light conditions are not required.

## CINE-KODAK SPECIAL II CAMERA ANNOUNCED

The famous Cine-Kodak Special Camera—Kodak's internationally known 16 mm. movie maker—now features a new type of lens turret, and improved reflex, eye-level, and peepsight viewfinders. The Cine-Kodak Special II Camera also will be equipped with the new Kodak Cine Ektar 25 mm. f/1.4 Lens as standard.

The newly designed lens turret—which is the most apparent outward change in the camera—is equipped with integral adapters which make possible the direct acceptance of the full line of Cine-Kodak interchangeable lenses. The adapters are of ball-bearing construction and lenses, once seated, are locked securely in position. The lens block is angled to prevent the second lens from interfering with the first, either

physically or optically—when the first is in picture-taking position. Any two current Cine-Kodak accessory lenses, regardless of speed or focal length, can be used in combination and with easy interchangeability.

Insofar as the reflex finder is concerned, an improvement in the internal mechanism results in the area viewed through the reflex finder being almost exactly that which will be seen on the screen. An improved viewing lens has been installed, and a sharply defined black border placed around the ground glass. This results in far greater ease and precision in through-the-lens focusing and framing.

Changes have also been made in the eye-level finder system. A separate front-finder element is now made for each of the full line of Cine-Kodak lenses. These finders snap onto the turret, and, because they provide a large view of the subject, make for greater convenience in eye-level finding.

Improvements in the peepsight are such that the sight can now be adjusted to correct for parallax at film-to-subject distances ranging from 2 feet to infinity, so that greater accuracy is possible in eye-level framing.

Aside from those changes and the adoption of the Kodak Cine-Ektar 25 mm. f/1.4 Lens as standard, the Cine-Kodak Special II Camera is identical with its predecessor.

Owners of Cine-Kodak Special Cameras who wish to have their cameras converted to the new model may do so through the Kodak Repair Department, it was announced. The conversion will include the installation of the complete new turret, and, in cases where the owner has not acquired the new standard lens and desires to purchase one for use with his camera, the supplying of the new lens.

The Cine-Kodak Special II Camera is priced at $860, plus tax.

## PORTABLE PROJECTOR STAND BOON TO CAMERA ENTHUSIASTS

People who like to show movies at home or when they go visiting now have an invaluable aid at their fingertips to take the place of the inevitably shaky bridge table and telephone books that is set up to hold the projector. A revolutionary portable projector stand that folds up to suitcase size, holds film reels, and can be carried anywhere, is the latest development in the photographic equipment field. The new stand, dubbed the "Porto-Projector Stand" and developed by George Drezin, sales manager of S & D Manufacturing Company, does away entirely with the table-shaking caused by the projector's motor. Other features

of this projector-enthusiast product are three tubular legs with rubber-tipped ends that support a table top, size 15 x 20 inches, centrally controlled by a thumb screw, and a frictional control lock mechanism that insures against any slipping while the unit is in use.

The legs are disconnected when not in use and snap into spring clips beneath the table. The unit is then closed by a cover held in place by two detachable hinges and a latch. The Porto-Projector Stands are made in two different models.

MODEL "A"—Made for silent and small sound projectors. The cover holds one empty reel and six 400 foot 8 mm. reel cans or four 400 ft. 16 mm. reel cans. $28.50. Approximately 36 inches high.

MODEL "B"—Designed for heavy sound projectors with table-top size of 16 x 22 inches. Legs screw into each other. Holds 1600 feet empty reel. $36.50, approximately 41 inches high.

For further information, contact S & D Manufacturing Company, 220 Fifth Avenue, New York 1, N.Y.

## LEICA PHOTOGRAPHY

The Summer edition of "Leica Photography", the quarterly magazine published by E. Leitz, Inc., at 304 Hudson Street, New York 13, N.Y., was issued on July 1.

The second number, which carries a photogravure section, is larger than the spring edition by four pages; it contains news of another contest, articles of interest to all photography fans, and features two pages of the column, "Notes and Tips." Although no advertisements are included in this issue, it is planned to print a few four-color inserts in future editions of the magazine.

"Leica Photography" sells for 25 cents a single copy, $1 a year in the U.S.A., $2 a year to owners or non-owners elsewhere; it is sent to *all registered Leica Camera owners resident in the U.S.* or its possessions, free of charge.

## ADVANCED MEMBERSHIP

Members may propose for the Fellowship in the Biological Photographic Association other members whom they consider worthy of recognition. Two sponsors are required. Information concerning the procedure and requirements may be obtained from the Secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa.

# Association News

THE LEONARD WOOD COMMITTEE ON PHOTOGRAPHY held an exhibit of clinical photographs at the Fifth International Congress for Leprosy, Havana, Cuba, April 3rd-11th. Mrs. Perry Burgess of the Leonard Wood Memorial and Ralph Creer, F.B.P.A., were co-directors. Most of the pictures were taken by William Taylor, F.B.P.A., at the U. S. Marine Hospital, National Leprosarium, Carville, La. They showed typical lesions; also a few good vs. poor methods of photographing patients. The enlarged prints for exhibition were made by the Eastman Kodak Co. Equipment applicable to clinical photography was also on display.

At the opening session of the scientific program, Mr. Creer read a paper on "Photography as Applied to Leprosy." He stressed the need for comparable photographich records from the various leprosaria, and outlined the problems involved in obtaining such records. The interest shown in this paper and in the photographic exhibit prompted Mrs. Burgess and Mr. Creer to post a notice (in the four official languages of the congress) stating that a meeting would be held to discuss clinical photography and pool the experience of the delegates. This informal seminar was attended by about 30 delegates. As most of these delegates had made photographic records or wished to find out how to obtain them, the discussion was stimulating.

In the official report on the Congress the following statement appeared: "This was the first time that such an exhibit has been held in connection with a world-wide conference on leprosy and it was the unanimous request of the delegates that it be made a permanent part of the subsequent conferences on this disease."

Dr. Oscar Richards, F.B.P.A., was a delegate from New York and Buffalo. He gave a paper on "The Application of Phase Microscopy to the Examination of the Leprosy Bacillus."

THE AMERICAN MEDICAL ASSOCIATION'S SCIENTIFIC EXHIBITS grow more elaborate by the year. It is as though the commercial firms' predilection for impressive show-cases and colored lighting seeps every year a little more strongly into the scientific section. The simple exhibit however can still be found here and there. Indeed it sometimes wins prizes. And in spite of the growing emphasis on woodwork and mechanisms that pulse, blink and revolve, the quality of the pictorial presentation goes steadily upward.

The transparencies this year were in the main excellent. Some of them were superb. We would like to single out some of the exhibits for individual mention (particularly as our members were involved in a number

of them). But the impossibility of doing justice to all in such a large exhibit, and of judging the differing circumstances under which the pictures were made, makes the mention of one unfair to another. Those who were able to attend the motion picture theatres being run by Mr. Creer brought back word to the booth-tied exhibitors that here, too, the quality of the photography was generally excellent. In these two important fields, the medical photographer found much that was stimulating in the exhibits. When it comes to color prints, the story is different. These are still in a stage that demands our indulgence. Good color prints can be made and a few were in evidence. But for the time being the standards in this field are unexacting. A print in which the subject is even dimly discernible passes muster. Considering the technical difficulties involved in color-printing this tolerance is understandable. It is a little harder to explain the fact that sometimes the black and white prints were of mediocre quality too, even in exhibits where the transparencies were excellent.

The tendency towards show-cases, simple or elaborate, has this in its favor: fewer pictures (hence more carefully chosen and better presented pictures) are used to tell the story. Wall-cases with a few striking transparencies were sometimes used, in combination with look-down cases along the shelves. The look-down is a dramatic method of presentation, especially for small isolated fields such as pictures taken through the gastroscope, or cervical photographs. It gives the visitor a glimpse exclusively his for the moment (at the same time resting his neck).

There was one matter in which many tranilluminated exhibits erred, even the most excellently prepared, and that was in the captions. Many of these consisted of lighted white backgrounds with black lettering, and they drowned the transparencies they were supposed to explain. It became obvious, as one progressed from one booth to the next, that black backgrounds with white or tinted lettering, are safer, and that even these need low illumination. The white caption, if preferred, needs to be toned down by diffusers or shielded from the interior light, until it is subordinate to the picture. Another pitfall resulted from an understandable effort to protect valuable prints. The cellophane or other transparent covering used tended to wrinkle, crack, sag, and reflect glare into the beholder's eyes.

"Photography of Patients" was the subject of the BPA's exhibit. Simple fundamentals about the type of camera and emulsion, various kinds of lighting, and methods of computing exposure were mounted in large type and illustrated with comparative prints. A series of Printons showed how the color balance may be corrected within certain limits when

prints are made from transparencies. The Printons were contributed by Pavelle Color, Inc., New York City, by the courtesy of Lloyd Varden, F.B.P.A., Leonard Perskie, F.B.P.A., of Graphic Studios, New York City, gave three fine carbo prints of clinical subjects. William Stevenson of Mt. Sinai Hospital, Cleveland, Ohio, contributed Wash-off Reliefs and Printons. The majority of the black and white prints were from the Mayo Clinic, several coming from Stan McComb, F.B.P.A., and two or three from Lardner Coffey. The Mayo Clinic Section of Photography also made the captions and mounted the exhibit. Black and white comparative shots showing lighting techniques, use of filters, films and camera angle, etc., were contributed by John Beiter, F.B.P.A., Ferdinand Harding, F.B.P.A., and William Taylor, F.P.B.A.

The booth was attended by Albert Levin, F.B.P.A., and Anne Shiras, F.B.P.A, with welcome help from Maria Elsasser and Charles Lindsay.

THE MEDICAL GROUP OF THE ROYAL PHOTOGRAPHIC SOCIETY held its first exhibition of medical photography at the Royal Society of Medicine in London, May 24th-29th, 1948. The 107 prints and 55 transparencies accepted by the judges represented approximately half the number submitted in each of these categories. Four films and one film-strip were also accepted.

According to a review in the British Medical Journal for May 22, 1948, the dermatologists and ophthalmologists contributed most to the exhibition, but there were a number of entries from gynecological and dental departments and almost every specialty was represented. The Medical Group had 153 members as of the date the review was written. Eighty-five submitted pictures for the exhibit.

PETER HANSELL, MRCS. LRCP. FRPS. BPA, Director of Medical Photography for the Westminster Hospital Medical School, London, spent three months this summer visiting medical centers in the United States and Canada. His visit was sponsored by the Nuffield Provincial Hospitals Trust, for whom he prepared a report on modern methods and recent advances in medical illustration. Among the cities he visited in the United States were New York; Baltimore; Washington; Pittsburgh; Indianapolis; Chicago; Milwaukee; Rochester, Minnesota; Iowa City; Rochester, New York; Syracuse; Boston and Hartford. His visit to Chicago coincided with the meeting of the American Medical Association. He was guest of honor at a dinner given by the Chicago Chapter of the BPA at Abbot Hall, Northwestern University. Several out-of-town members, on hand for the medical exhibits, also attended the dinner. Dr. Hansell gave a short but interesting speech on his impressions of medical

photographic work in the United States, which was followed by an informal discussion about photography here and in England.

MISS ANNE RUSSELL, formerly in the Photographic Division of the University of Texas Medical Branch in Galveston, has opened a department of photography in the Medical School of the University of Virginia.

THE FORMATION OF STURGIS-GRANT PRODUCTIONS, INC., producers of special purpose films and filmstrips, with offices at 314 East 46th Street, New York 17, N.Y., was announced by Warren Sturgis, President of the new corporation.

The main aim of the new company, according to Mr. Sturgis, will be: "To advise, assist and work with the members of the medical and allied professions and with the technical and commercial organizations connected with them in the production of audio-visual aids of the highest quality at reasonable cost."

Mr. Sturgis, who, during the war, was head of the Motion Picture Laboratory of the U. S. Naval Medical School at Bethesda, Md., has produced films for the Harvard Medical School, the College of Physicians and Surgeons, New York City, and the Health and Safety Department of the T.V.A. during his ten years of activity in this field.

---

## General Electric X-Ray News

**Monthly medical newspaper of the General Electric X-Ray Corporation**

—is interested in publicizing outstanding examples of biological photography. You are invited to submit samples of your work to the publication, care of David Goodman, Editor, 4855 West McGeoch Avenue, Milwaukee 14, Wisconsin.

Only glossy prints, with sufficient detail to tell the story despite being broken up into a 100-line screen for reproduction on news-print paper, should be submitted. Captions should be complete both as to photographic technique, medical terminology, and name of the photographer.

# BPA Officers and Committee Chairmen

| | |
|---|---|
| President | Edmond J. Farris, Ph.D.<br>The Wistar Institute<br>Philadelphia 4, Pa. |
| Vice President | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Secretary | Anne Shiras<br>University Office<br>Magee Hospital<br>Pittsburgh 13, Pa. |
| Treasurer | Stella Zimmer<br>Photographic Department<br>School of Medicine<br>Syracuse University<br>Syracuse 10, N.Y. |
| Editor of Journal | Leo Massopust<br>Marquette University<br>Milwaukee 3, Wis. |
| Motion Picture Committee | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Committee on Grants | C. Graham Eddy<br>Veterans Administration<br>Washington 25, D.C. |
| Public Relations Committee | Dr. Arthur W. Proetz<br>12 Westmoreland Place<br>St. Louis 8, Missouri |
| Annual Salon | Nathan S. Horton<br>P. O. Box 6115<br>St. Laurent<br>Montreal 3, Canada |
| Committee on Fellowships | Ferdinand R. Harding<br>The Children's Hospital<br>Boston 15, Mass. |
| Committee on Sustaining Memberships | C. Graham Eddy<br>Veterans Administration<br>Washington 25, D.C. |

## B. P. A. MEETING – Philadelphia, Pa.

**SEPTEMBER 8-10, 1948**

**See the GAMMA MICROFLEX**

**The only really universal Photomicrographic Assembly for 4 x 5", 3¼ x 4¼", and 35 mm.**

with

Mirror Reflex Camera

Zircon Arc Lamp

Vibration Absorber

Camera Desk

Duracolor Filter Set

Also available are:

35mm. Attachment

Low-Power Stage

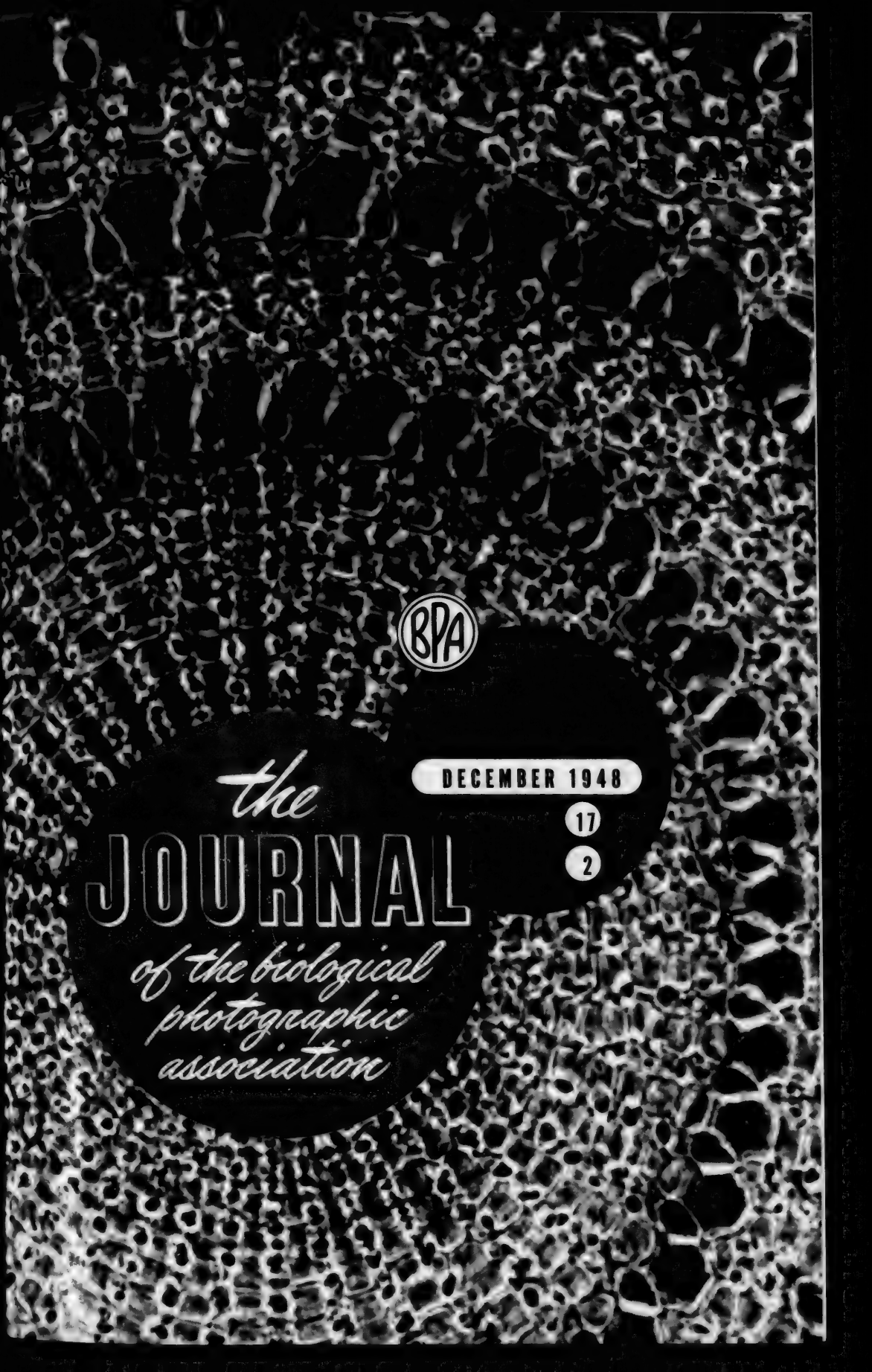
Macro Stage

Micro Raptar and Raptar Objectives

Write for new folder "G22" to

**GAMMA INSTRUMENT COMPANY, Inc.**

**95 MADISON AVENUE — NEW YORK, N.Y.**


BPA
the
JOURNAL
of the biological
photographic
association
DECEMBER 1948
17
2

# Program ? ? ? 1949

This year symposia and an early smoker were added to the annual Convention. The smoker served to make all acquainted quickly and to increase the friendly feeling throughout the meetings. In order to learn what you would like to have on the program for the Cleveland Convention next year, a brief questionnaire was given to the members and 53 filled in more or less and returned them. This information, rating the past program and suggesting what you wish, is very helpful to your Officers and we all appreciate it. Since some couldn't come to Philadelphia, it was decided to summarize the information herein and ask all of the rest of you to send any comments or requests to our Secretary, Miss Shiras. While it will not be possible to cover all the requests in 1949, they will be covered in the next few conventions.

The questionnaire listed the major features of the program and asked each member to number them in order of their value to the member, with number 1 for the greatest, to number 5 for the least useful. The weighted averages are as follows: Papers 2.59; Motion Pictures 2.48 (Kind: biological, medical, entomological, unusual and rare, each 1 vote; with information on how made 2 votes); Clinic on biological films 3.35; Symposia on clinical photography 2.15, on lantern slides and copying 3.31; on motion pictures 2.65; on photomicrography 2.0. Five commended the smoker and one each favored the following: awards to prints and to motion pictures, visual factors in color, departmental administration and color processing. This shows that no one feature was wholly pleasing or wholly displeasing to any great number of members and that the interests of the members now cover the entire field of photography.

The second question asked was: "what would you specially like to have on next year's program?" Six voted for "how to do it" papers and one for equipment and gadgets. Four voted for a photomicrographic demonstration, and to these might be added requests for new equipment and information on the zirconium arc. Two votes each were received for the following topics: recent advances in medical photography, color processing, photographing operations, and demonstration technics. The following topics received one vote each: clinic on scientific exhibits, preparation of exhibits, electronic flash technic, more commercial exhibits, more demonstrations, "how to do it" in an ordinary laboratory, departmental administration, filing and bookkeeping, instruction in

*(Continued on Page 63)*

# The JOURNAL of the Biological Photographic Association

Volume 17 • DECEMBER, 1948 • Number 2

Official Publication of the Biological Photographic Association

COPYRIGHT, 1948

## CONTENTS

Medical Education and the Motion Picture ..... Warren Sturgis 51

An Auxiliary Microscope Base for Use in Photomicrography ..... Zane Price 59

BPA Annual Award for 1948 ..... 64

Six Short Educational Films of Microbes ..... Dr. A. Pijper 65

Book Reviews ..... 70

Letter Height in Relation to Legibility on Standard Lantern Slides ..... Robert A. Sage 73

News from the Trade ..... 78

Two Methods of Producing Excellent Lantern Slides from Kymographic Records ..... Robert D. Wolf 81

Association News ..... 85

Leo C. Massopust, Editor

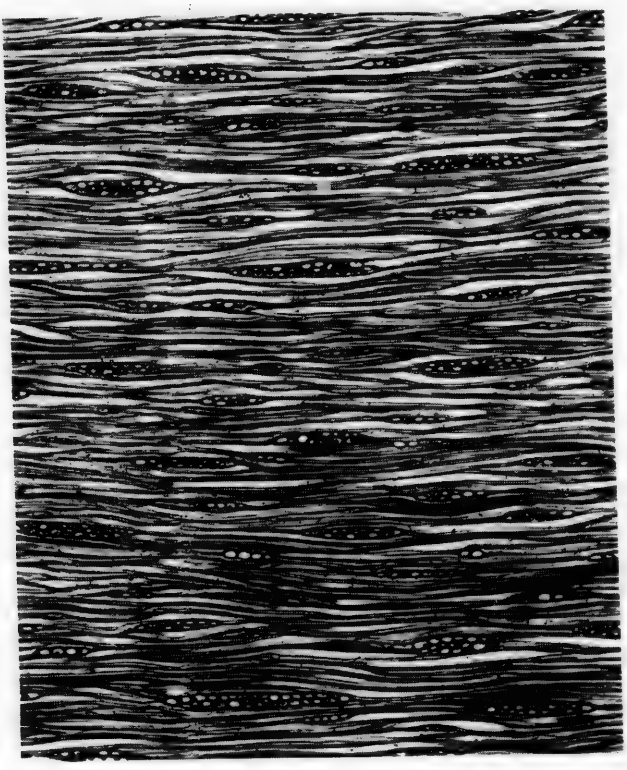
Marquette University School of Medicine

Milwaukee 3, Wisconsin

A S S O C I A T E E D I T O R S

ARTHUR W. PROETZ, M.D., Beaumont Building, St. Louis, Mo.; ANNE SHIRAS, School of Medicine, University of Pittsburgh, Pa.; FERDINAND HARDING, The Children's Hospital, Boston, Mass.; and ARTHUR W. FUCHS, 164 Inglewood Drive, Rochester, N. Y.

Published Quarterly at 561 North 15th Street, Milwaukee 3, Wisconsin. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $5.00 per volume; foreign countries $5.50. Single copies $1.25 in U. S. A.



Black Ash Stem 120X

Pine Needle 65X

Richard W. St. Claire

# Medical Education and The Motion Picture

**Warren Sturgis**

TODAY we hear a great deal about audio-visual education. We read of its importance in the educational process; we are told the "dos" and "don'ts" of making films, film-strips, and slides. Top men in the medical profession have discussed films in relation to medical teaching; some of the best photographers have set down rules and precepts to be followed in undertaking medical motion pictures; and the American Medical Association has even made a film on the history of the movement, including a section on film production.

A great deal of thought has not been given, however, to the background of the medical motion picture—not its history—but the reason it exists as it does today. That is why, from this rather broad title I have taken, I am going to speak of some of the more nebulous ideas, the thought processes behind the development of this educational aid, and to express my belief in the importance of the role of the medical cinematographer.

1. Those of us who have been closely connected with medical photography of one sort or another for some time, might pause for a moment and recall that twelve or fifteen years ago there was little emphasis on photography, still or motion, in teaching, when compared with the situation today. Of late, our activities in the realm of teaching have expanded enormously, until now the greater part of the photography done in our large medical centers finds its way in some form into the teaching material of the various courses of instruction. This change of emphasis has been the second important development in teaching methods of modern times. The first change came about three or four decades ago. Let us go back for a moment and examine the methods in use at the outset of the century.

At that time learning was almost entirely a matter of listening to lectures, which were supplemented by textbooks. Our scientific training stemmed from the German, and the erudition of the teacher was all-important. It was the accepted thing for a professional man fitting himself for a university position, and looking forward eventually to a

Received for publication September 27, 1948. Presented at the Eighteenth Annual Convention of the Biological Photographic Association, held in Philadelphia, September 8 to 10, 1948.

professorship, to go to Europe for medical study for a year or more at Vienna, Heidelberg, or Leipzig. It was natural that he should return, imbued with the lecture method, and teach in the same way at Hopkins, Chicago or Harvard.

But a lecturer, be he inspiring as Osler, eloquent as Zinsser, can merely serve as a means to an end. The brilliant student will absorb facts as well as inspiration from the lectures, and because of an inquiring, scientific mind will inevitably pursue his career; but his actual learning will come through his hands. Great men of medical science, Koch, Ehrlich, Pasteur, learned by doing, by constantly experimenting; they were great because of what they did, and not because of what they said. As the science of medicine turned the corner into the twentieth century, this idea was coming to be appreciated in our schools, and as it did, a new system of manual learning came to take a place of equal importance with lectures and texts.

This was the introduction of laboratory work into all courses of scientific instruction. As knowledge grew, laboratory methods were standardized. Dissection in anatomy had been recognized as a teaching medium since the time of daVinci, and earlier; now, experiments in physiology, chemistry, and pharmacology were added. Today, practically every course in our medical schools involves laboratory experiments. Material to be covered is naturally preplanned and outlined; it would be ridiculous to expect each man to take the time to work out his own methods for each project. What he is expected to do is to follow basic directions, arrive at results in conformity with generally known facts, and draw his own conclusions therefrom. After that, he is on his own. If he has learned properly to interpret his findings and has a background of solid, basic technic, he is in a position later on to carry out his own research, and add, himself, to the large storehouse of human knowledge which is being steadily supplemented by the work of the outstanding scientific men in every generation.

2. I have called laboratory methods the first new learning system of modern times. The second, it is becoming increasingly obvious, is the progressively wider use of audio-visual training aids throughout the educational field.

The growth of this movement in our teaching institutions has been slow. In the past generation a few slides were all that could be found to try and raise the back-row student from his lethargy during a drousy lecture. These were generally non-scientific, and confined to courses in the liberal arts. Today it is rare in our larger schools and colleges that any scientific course does not include at least some use of visual aids.

There is no need here to elaborate all the types of these aids, ranging as they do all the way from simple blackboard demonstrations or colored charts up to colored, sound movies. Since we are concerned with this more complicated type, we shall look briefly at the progenitors of our modern motion picture.

It has taken a long while for films to be accepted as an educational aid. The reason for this slow progress was due in large part to the fact that "the movies," i.e., theatrical films, had a long headstart. The thriller and the farce gripped the public in the early days of films, with an occasional "epic" thrown in to answer critics who said that Hollywood had no serious intentions. Pioneers like D. W. Griffith made a few "period" pictures which were outstanding, both for content and technical production details.

Most such film classics dealt with history, as did those produced by independent film groups like that which produced the famous Yale Historical Series. There were a few early experimenters in scientific research also, men like Muybridge, whose analyses of gaits of a horse by multiple exposures long ago foreshadowed later motion picture work. A number of medical films were even attempted before 1920, several during World War I, but they were little publicized, and little seen.

By and large, however, the movie was a vehicle shunned by educators. It was considered merely a spectacle for entertainment, not necessarily harmful, but certainly not a form of exposition which could hold any value, it was thought, for the scientist or teacher. It was still a medium at which one marvelled, representing an industry of colossal proportions and questionable morals, centered on the west coast. If there had been educational pictures available, there would have been little market for them, for few projection facilities existed in the schools.

It has taken many years for educators to change their attitude with regard to motion pictures. The first influence tending toward this was the appearance of better Hollywood films. Possibly the revenue from thrillers fell off; possibly there was a sincere desire to produce more serious pictures, but at any rate the time came when a distinctly different approach could be noted within the industry. The advent of general use of "the talkies" in the early thirties greatly furthered this; we saw on the screen such characters as Henry the Eighth, or Zola, whose lives were documented in great detail. The movie public was less coddled, and was permitted to see the realism of "All Quiet on the Western Front," the stark horror of "Fury," the serious integrity of "Cavalcade."

The documentary film movement was another important influence in bringing truth to the screen. Flaherty, Grierson, and Lorenz found

that if the film were stripped of its artificiality and elaboration, conditions, events, and natural situations could tell their own story. This was no studied attempt at producing an artform; the films were a direct outgrowth of their subject-matter. Thus great documentaries like "Nanook," "Man of Aran," and "The River" came to be filmed.

Progressive education was a growing force in the thirties. It was no longer ridiculed as radical and revolutionary. It had been through the fire of criticism and had survived, with its worst elements discarded. Teachers in progressive schools and colleges had begun to take notice of the serious potentialities in films, and to see that they might be actually instructive. Committees were formed to recommend specific subjects for children. Many travel pictures were included in these, as were the growing number being produced on industrial methods. As these short subjects were accepted and shown more and more, the educational level was raised until they were being made, not for grammar-school, but for high-school and college audiences. As yet, however, one development was lacking to make a general conversion of teachers to film use complete.

This luckily was supplied by the manufacturers. It was supplied actually without premeditation, for 16 millimeter home movies had been developed with the idea of providing pleasure for those rich enough to afford the equipment. Almost overnight there was a deluge of requests for more serious 16 millimeter films, and the distributing bureaus began to see they could capitalize on the plan of stocking teaching movies to send to schools. One final step in this trend came with the perfecting of 16 millimeter cameras and accessories. There was a wide gap between the early, hand-held, amateur cameras, and the reliable, precision machines which were in wide use by the late thirties. No longer did the scientist have to rely either on cumbersome 35 millimeter equipment, or on inadequate 16 millimeter cameras for recording research or turning out a short instructional film.

The increasing use of the smaller-gauged equipment meant that films were literally available to all. It became unnecessary to spend several thousand dollars on a projector, erect a fire-proof booth, and hire an operator. A 16 millimeter sound projector was within the reach of the average high school, and anyone could run it, anywhere, with a few minutes instruction. Many educational films were therefore made now on 16 millimeter stock, and there was a definite purpose in reducing those made on 35 millimeter. Consequently, producing and distributing companies for classroom films sprang up. In the scientific field leaders like Eastman Kodak Company and ERPI took infinite

pains in producing films which were to go out over the country to hundreds of schools and colleges. Sixteen millimeter teaching films were here to stay.

3. If educators in general were slow in accepting this new medium, the conversion of the medical profession to films has been doubly difficult. By nature skeptical of new processes and new methods until thoroughly proven, its members lagged behind in understanding that movies could be an aid to teaching. The tendency of medical thought has always been that any article, demonstration, or lecture that was of a dramatic nature could not be scientifically correct. Thus a premium in the past was unconsciously put on dullness, on a recital of facts, or a table of figures. Although there were exceptions, this attitude was generally accepted, and perhaps naturally so, for it is rare that one finds the literary ability of a Holmes or a Cushing combined with the scientific. Ordinarily, the researcher who does his work conscientiously and completely wants to get it published as quickly as possible, so that he can return to his studies; he does not have the leisure to produce a vitally interesting piece of literature, even if his ability to do this has not been stifled by years of purely methodical thinking.

The great men of research, those who have contributed to our knowledge because of what they have done, hold the important teaching posts in our medical institutions. They are the men who for the most part grew up without the benefit of audio-visual aids. Therefore, it is possible to find even now older professors who believe that the hard way by which they learned is the only proper method of learning, and that modern aids should have no importance in the curriculum. This reluctance to change is a common, albeit regrettable, human trait. In the situation under consideration, however, it must be admitted that something could be said in the past for this attitude. Medical films of ten and fifteen years ago were often so poor it is no wonder that audiences refused to sit through them. The majority had little teaching value, and no photographic merit; they were done, mainly in the field of surgery, to promote the personal interest and name of the doctor.

Despite these inadequacies, attendance at film showings during medical conventions gradually increased, as the films themselves became better. Over the period of the last ten years the profession has been made aware of the difference between good and bad pictures. The value of carefully prepared teaching films has been recognized, in the same way that new and better laboratory experiments supplemented the early lecture and text methods of teaching.

Several mental processes have helped bring this about, processes which are typical in the acceptance of any new medium. The first might

be called the "anti-frustration" process. For many years a professor has been teaching a basic subject; he finds that although he has worked over and improved his lectures, there are always a few points which are difficult to make clear to his students. Their examinations show that there are some who never seem to understand certain fundamental principles. The professor happens to see a technical motion picture, one which by its very nature, the freedom of its handling, the clarity of its exposition, gives him an insight into a possible new approach to his own teaching. He says to himself, "I must have a picture as good as that to supplement my lecture, to show that difficult technic, and to explain by a neat diagram the theory behind it."

The process of "co-relation" is more simple. Instead of becoming aware that a different approach may solve an old problem, the professor sees a film which tells of an entirely new problem, or a highly successful method in clinical practice which relates directly to his own work. Here the movie sells itself, and he looks forward to the time when he can put on film the research he himself is doing, and present it before his colleagues.

One important fact which has influenced medical educators to use films is that, with the vast amount of material to be taught to medical students today, it is absolutely vital that the basic principles be understood by them as quickly as possible. Just as medical texts were improved greatly in the twentieth century, so that the diagrams and drawings have shortened the students' learning-time, so modern films are able to cut this time even further. The ancient cry, "Let the student learn the hard way," has no rational basis today. The professor who expects his students to learn the fundamentals of physiology or biochemistry as he himself did many decades ago, without modern texts, laboratory methods, or visual aids, will find they can never cover the ground necessary for a comprehensive understanding of the subject during the short period which is all that can be allotted to his course.

Obviously, the only valid excuse for the present-day widespread use of films is that they are fulfilling their inherent purpose. We all know how the Army and Navy found in World War II that recruits in the Medical Corps, as well as in other units, could learn and retain a required amount of knowledge in a much shorter time when visual aids were used to supplement the traditional lectures. The results of careful surveys conducted in the Armed Forces have been published and proved this fact again and again.

Several important results have followed from the success of the Army and Navy Training Film Programs. Hundreds of officers who used films in teaching the men under them have returned to civilian

life, and, having become film-minded, are looking for the same materials with which to train their students, in medicine, dentistry, or nursing. They will not be satisfied with mediocre productions any more than they were previously satisfied with mediocre medical equipment. This single factor has done much already to raise the standards of medical motion pictures.

Consequent upon the published surveys mentioned, a great deal of thought has been given to the actual production of different types of educational films. These have been put into categories, and terms such as "record and report," "instructional," and "demonstration" commonly applied to them, with fine shades of difference. In other words, educators are now getting down to the heart of the matter, or just what, why, and how motion pictures actually teach. They have the backing of such eminent groups in the medical profession as the American College of Surgeons, the Association of American Medical Colleges, the Government's Interdepartmental Committee on Audio-Visual Education, and many of the specialist associations. It is particularly gratifying that the American Medical Association itself has entered the field in a positive manner. Although for some time film programs have been a part of the annual convention, only in the last two years has the Association taken an interest in trying to guide the field with intelligent criticism and direction, in order to raise production standards. Their film committee keeps abreast of present-day developments, and reviews new films in the Journal, most widespread of medical periodicals in this country.

4. Up to this point I have traced the growth of motion pictures, to show how they have gradually permeated our educational system, and have tried to describe the reasons why, after long years, they have been finally accepted as true aids to learning by the medical profession. This paper would not be complete without some brief mention of the man who actually produces the medical film, who sits at his desk and tries to figure out just what in heaven's name the doctor really does want to show, and who must go out and translate the subject onto celluloid.

The doctor with a piece of work appropriate for a motion picture is today faced with a dilemma. He may happen to have on the staff of his hospital a competent movie photographer with good equipment. If so, he is lucky indeed, for good equipment is notoriously expensive, and the medical motion picture specialist is still rare. There are no short cuts to his training, and although many came out of the War having gained their experience in the field, there are not enough to go round. Usually the doctor must realize he will have to hire a producer with experience, or rely on some friend to "push the button" on his own

camera. Hiring a producer can be expensive, but often less so than using the ineffective and untrained friend.

A good staff photographer, keen on visual education, is a gold-mine. He must be possessed of several particular attributes, among which tact, intelligence, imagination, and progressive thought stand high. He must be tactful, for the relationship with doctors is always one which must be carefully managed. You cannot push a doctor into a project; you can't use coercion. You may suggest, you may demonstrate, you may work out a script, make models, draw diagrams—and you may be rewarded by his vague interest. But you are dealing with highly-trained, individually-motivated men who know, or think they know, just what they want. Tact is most necessary.

Scientific intelligence is taken for granted in the medical cinematographer as well as in any technician. Some medical training is a help, but not a necessity; a sound photographic skill is far more important. He must be able to learn, and if this ability is coupled with scientific honesty, the results of his work will be more and more valuable as he betters his technic.

Imagination and progressive thought are too often sadly lacking in the man who is in charge of film production. A motion picture department in a medical center must be handled quite differently from a still photographic department. The responsible and progressive man will keep abreast of the literature, and of other recent medical film production. He will bring the latter to the attention of the properly interested department, arrange for showings of new films, and of those which are regularly used in the various classes. He will know the important work going on in his institution, will suggest film projects, demonstrate how they can be carried through, and what their value will be. However, if he waits for work to come to him, for ideas to emanate from outside, he will not be advancing the cause which he serves, and will be merely a paid technician.

I conceive the functions of the medical cinematographer to be as important as those of many a researcher today. In the role of visual education expert, he should take his rightful place of importance as coordinator for the activities of the teaching center to which he is attached. As he receives cooperation, understanding, and encouragement, he can be a progressive force, and the worth of his films will be measured in terms of his own competence and initiative. With an inquiring mind, with imagination and insight, he can be a most valuable member of the professional staff, and have the satisfaction of knowing that he is directly contributing to human progress.

# An Auxiliary Microscope Base For Use In Photomicrography

**Zane Price**

PHOTOMICROGRAPHY is gaining more and more prominence among scientific personnel and the desirability of the various workers to adapt the regular microscope to meet these demands has become rather essential. The average microscope, providing its optics are good, serves fairly well for use in the horizontal machine; since the microscope mirror is removed and the optical axis runs straight from filament to film. However, the biological worker very often must work with wet mounts and not being able to use the microscope in the horizontal position must deal with many inherent disadvantages of the microscope in its present day form.

In order to overcome a few of these disadvantages the following microscope base to convert a regular microscope for use with the vertical photomicrographic machine or setup was designed and constructed.

### *The Base*

The first disadvantage of the microscope as it is manufactured at present is its lack of weight. One of the first requirements of a good photomicrographic microscope is rigidity and weight, which helps to a great extent to control vibration. At high magnifications vibration must be reduced to an absolute minimum. On the larger machines this is accomplished by bolting or clamping the microscope to the basic stand which in itself weighs enough to accomplish this purpose. However, on the less expensive and therefore more popular setups, which usually consist of a small plate to which the microscope is clamped and an upright column, the basic stand does not have enough weight to accomplish this purpose. The described base overcomes this disadvantage by supplying a larger foot and greater weight. Both of these features serve to reduce vibration to a minimum. If it is found that vibration is still a factor the regular leveling feet may be interchanged with cushioned vibration absorbers.

### *Mirror And Mirror Mount*

When using the microscope in the vertical position the mirror supplied with the microscope affords the simplest method of obtaining

Received for publication September 6, 1948 from Walla Walla College, Washington.

bright field illumination and for visual work is usually sufficient. However, close examination of the illumination when using this mirror will show that several images of the source of light may be formed in the field of view. This may be seen when the field diaphragm is closed sufficiently to appear in the field of view. These access reflections are due to the double or triple reflection from the first and second surfaces of the mirror. Normally, the mirror supplied with the microscope is silvered on the second surface to protect the coating from oxidation and accidental scratching. The main image of the source is formed by the condenser of the microscope in the center of the object field by reflection from the silvered surface. In addition to the light reflected by the silver, some light is reflected from the first surface at a slightly different angle, thus forming a secondary image after passing through the condenser. If the illumination is sufficiently intense, some of the reflected light from the silvered surface may be reflected back again from the first surface to form even a third image of the source.

When a photomicrograph is being made of a contrasty specimen and low apertures are being used, the extra illumination images cause little or no trouble. But when using large apertures and subjects prone to glare, the presence of the secondary and possibly tertiary images may add just enough scattered light to spoil an otherwise good picture. Even though the secondary images may lie beyond the field of view, when the illumination source is made large enough, it does not help; glare can still be produced within the visible field.

Another objectionable feature of the ordinary microscope mirror is the fact that manufacturers have not considered it worth while to align the exact center of the mirror with respect to the optical axis of the microscope. Because of this it is usually impossible to correctly center the source of illumination to the optical axis.

The mirror as a general rule will be found correctly centered in an east-to-west direction; error, if any exists, ordinarily lies in the north-to-south direction. Then too, the mirror, once it is aligned and set in position, a procedure that requires no small amount of time, can very easily be jarred out of position and the whole process of realigning must then be repeated.

There are two ways of overcoming these flaws. The first method, in use for some time, is to discard the mirror and substitute a right triangular prism of glass or quartz; quartz being most useful in ultra-violet work. The second method and by far the more practical for nearly all work, including ultra-violet, is to substitute a first surface mirror. The prisms are expensive, hard to obtain, and equally hard to mount.

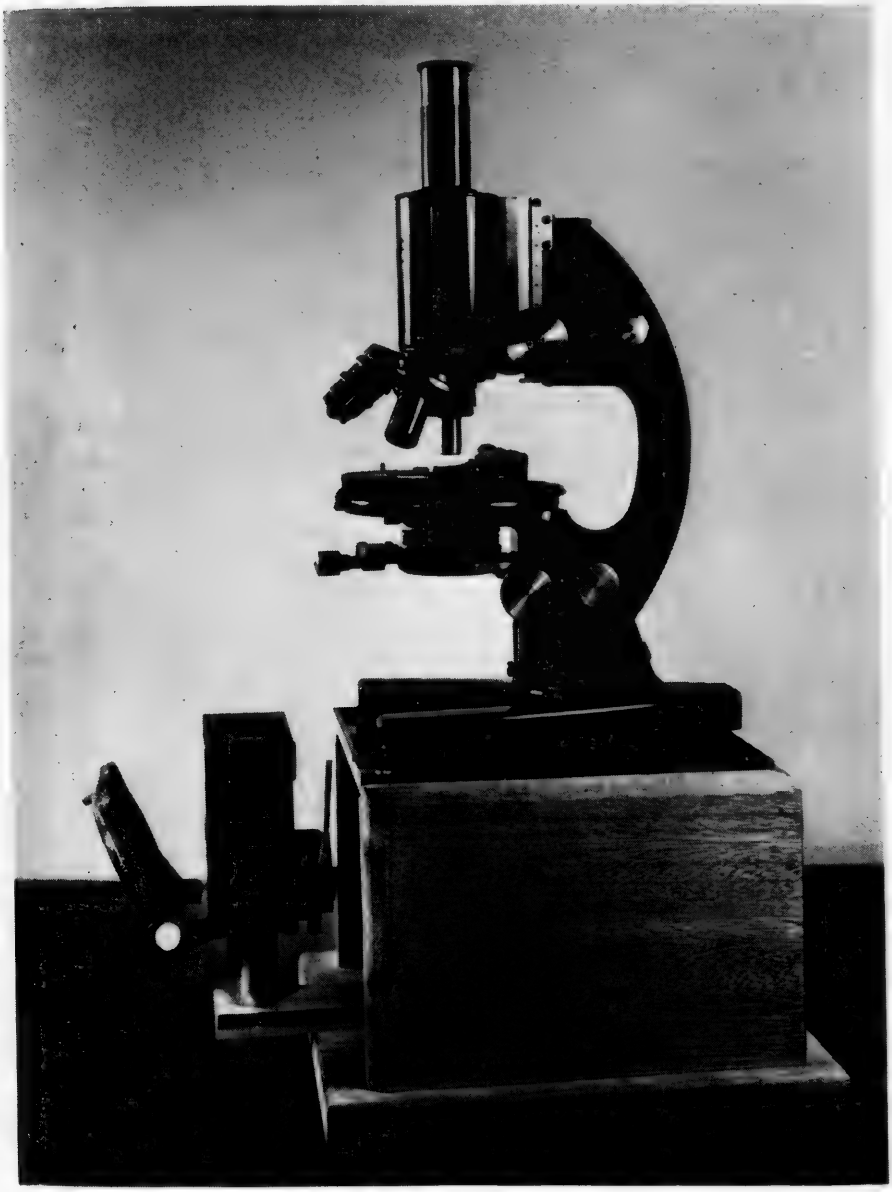


Figure 1.

In using the auxiliary base the microscope mirror is discarded and light is directed up through the microscope by an optically flat first surface mirror mounted underneath the microscope mounting plate. This mirror is held in place at a permanent 90 degree angle to the optical axis of the microscope by an immovable mount. Mounting it in this position brings the mirror to the approximate level of most microscope lamps and added room for the use of substage accessories on the microscope is provided.

The microscope base plate opening through which the light from the mirror passes is fitted with a removable polaroid filter for use in securing polarized illumination. It is also provided with a positioning stop, so that the microscope may be removed and replaced from the auxiliary base without the bother of recentering it each time.

### *Filter Mount*

Mounted on a movable arm in front of the mirror is the water cell holder, filter rack and variable density polaroid filter. This arm allows the group to be centered laterally. The entire arrangement is then mounted on an adjustable column for centering in the up and down position.

Many specimens demand the use of light filters in order to increase contrast and detail, thus in order to use the standard 2 by 2 inch photomicrographic filters a rack of some sort is usually mounted in the optical axis. Filters should not be placed near the lamp because of accessive heat, but since microscopes are not provided with a means of holding them, a rack becomes a necessity. In order to facillitate the use of these filters a permanent filter rack is provided as an integral part of the base. It will hold up to four filters including opal glass diffusing discs.

A water cell holder is provided as part of this unit and may be used if it becomes necessary to cool the light beam when photographing heat sensitive material. Usually, though the 2 by 2 inch heat absorbing glass placed in the filter rack will suffice.

### *Variable Density Filter*

When photographing in color—it is of vital necessity to maintain a constant Kelvin temperature in accord with the type of color film being used. Often when the correct voltage or filters are applied to correct the Kelvin temperature the intensity of illumination is too high for practical exposure. In order to correct this a variable polaroid filter is attached as an integral part of the filter mount. Once the Kelvin temperature has been set the intensity of the illumination may be varied by merely rotat-

ing, by means of a small handle, one of the component polaroid filters. A word of caution is advisable when using this filter. If it is rotated too far a noticable blue tint will be imposed upon the photograph. To avoid accidentally turning this too far a set screw is provided to limit its range of rotation.

When calculating exposure with this filter in place, an exposure factor must be taken in consideration as with other photographic filters. The factor in this case, however, varies with the degree of rotation. With the filter wide open it is taken as six. If the filter is closed down the exposure can best be found either by the test strip method or by measuring the illumination with a photo-electric cell and computing the exposure from the reading given.

---

## *Program*

*(Continued from Front Cover)*

motion pictures, especially color, symposium on gross specimens, how to do 20 dozen lantern slides per hour, 1950 convention in Montreal.

One member suggested a session on how medical photography was sold to your department. The most general request was for motion pictures showing how to make, or how a motion picture was made. How many of you have such a picture to show, could make one to show?

As to the conduct of the meetings six members wish shorter after dinner speeches, two want papers limited to 20 minutes and to stop speakers after that much time, two wish one free evening and the following suggestions came in one by one: no evening sessions, less day and more evening sessions, fewer papers, simpler papers, air conditioning, more time for meals, less motion pictures and more on how they were made, and to limit symposia to one hour.

There you are! You know how the membership felt at the end of the session from those with still enough of what it takes to fill in a simple questionnaire. Now let us hear from the rest of you, what do you wish to add to make the 1949 Convention the best ever? (Better sit right down now and get it on its way to our able secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13).

# BPA Annual Award for 1948

Leo C. Massopust

THE award, to consist of a lettered scroll and jewelled key, was given with the following citation:

"Anatomical artist, medical photographer and radiographer, he has extensively contributed to the aims, activities, and ideal of biological photography. As an artist, he has demonstrated talent that reflects his genius for meticulous anatomical detail. As a photographer, he has for years produced outstanding examples in the fields of still photography and photomicrography that have materially aided the teaching staff of the medical school where he has his laboratory. His contributions to the use of infrared photography in the study of the superficial venous system have recently led to its diagnostic application in the clinical detection of mammary malignancy. In the study of capillaries from a physiological and pathological standpoint, he assisted materially in the preparation of photographic and x-ray studies that have become invaluable as teaching material.

As an editor, he had had the often thankless task of maintaining a most worthwhile journal for the Biological Photographic Association. His loyalty, breadth of view, ability to overcome inevitable obstructions in publications that result in "on schedule" production is well deserving of the recognition of the Association. The interests and almost the "life-blood" of the Association are represented by its Journal, and our Editor and fellow associate.

The Board of Directors of the Biological Photographic Association name Leo C. Massopust, FBPA, of the Marquette University School of Medicine, first Annual Award winner.

EDMOND J. FARRIS,
*President.*

# Six Short Educational Films of Microbes

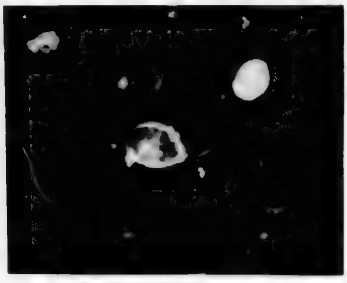
**Adrianus Pijper, M.D., D.Sc., F.B.P.A.**

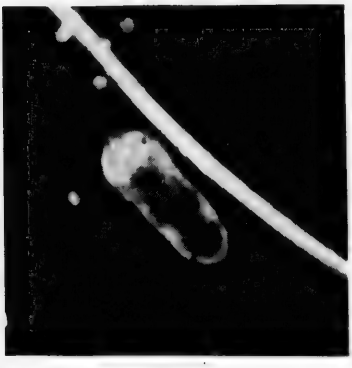
THIS is a description of six separate motion pictures of 100 feet each, five of them dealing with one microbe and one with two microbes. They are all microcinematographic, except one, which is a close-up of microbial growth on a solid medium, and are all 16 millimeter silent films. The smaller microbes were taken with the sunlight darkground apparatus described before (1930, 1931-32, 1938, 1940, 1942); for the larger ones a 100 CP pointolite lamp was found to be sufficient. For time-lapse the apparatus previously described (1942) was employed.

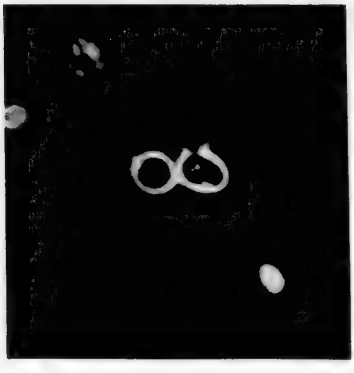
Micro-cinematography is usually regarded as difficult. Good apparatus is essential. The main ingredient for success is patience. Microbes have their whims, and so have pieces of apparatus. One must be prepared to waste large quantities of film, and to keep on trying until the microbe behaves as one wants it to. If a quarter of the exposed film turns out to be usable one has done very well. Every movie-maker knows that his besetting sin in editing is to exclude too little, to include too much, to retake too rarely. In micro-cinematography with its inherent difficulties in setting the scene, the temptation to commit these faults is particularly strong. Things happen under a microscope that cannot be repeated at will.

The first five films can be regarded as a study of motility in the microbial world in its various forms. The work started as a means to get practice and experience in micro-cinematography, and was continued because the subject became absorbing. Finally it was realized that the films were of educational value and are now regularly shown to students. Students are taught that yeasts bud, but can they ever witness this except in a time-lapse film? No teacher can have dysentery amoebae or syphilis spirochaetes available for demonstration at all times. This is where films of the kind described herein are useful. The scope of microbiological films is unlimited, and their educational value need not be stressed here. Explanatory titles are provided throughout

Received for publication May 28, 1948, from the Institute of Pathology, University of Pretoria, South Africa.





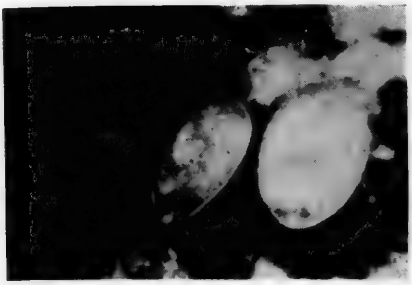


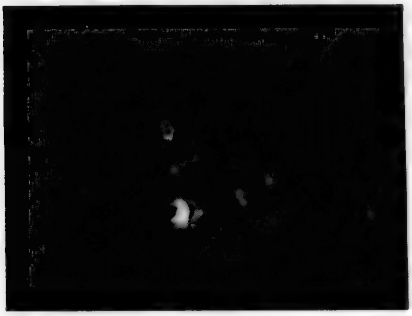
the films, but a running commentary by the demonstrator remains desirable.

The cine-micrographic films are all made with the darkground microscopy method, because this gives such good contrast and much fine detail.

1. *Treponema pallidum.* The film shows scrapings from several primary sores of syphilis. Clear fields in which a treponema is practically by itself, alternate with crowded ones where the treponema can just be made out against a background of red cells, pus cells and debris. The student must be taught that he will not always succeed in getting a perfect scraping from every patient. Titles call attention to the characteristics of treponema pallidum. One is the poor motility, many treponemata lie almost motionless, while others perform slow movements often to and fro movements. Another feature is the tendency of many to bend in the middle which is particularly well brought out. Thirdly there is the extreme regularity of the spiral curves. This is emphasized by showing pictures under very high magnification. Figure 1 is a copy of one of these. A few slightly abnormal forms are also shown.

2. *Trichomonas vaginalis.* The film shows a drop of vaginal secretion, exhibiting numerous trichomonades, with their incessant tempestuous movement, and their curious asymmetrical bodies. This film proves its superiority over still pictures as a method of demonstration. Figure 2 is a copy of one frame. It shows two flagella only, and nothing of an undulating membrane. In the film four flagella become readily visi-





ble, and also their method of attachment to the body. When, with time, movement slows down, the film shows a slowly undulating membrane. In addition the cytostome and the sharp point by means of which the microbe attaches itself are well brought out. No still picture could ever leave behind such a vivid mental picture of the nature of trichomonades as this film does.

3. Ova and miracidia of *Schistosoma haematobium.* This film teaches the student to recognize the ova of *Schistosoma haematobium,* and especially the different shapes the miracidia can assume after hatching. Hatching takes place quite readily in urine, it is not necessary to transfer the ova to water. First highly magnified over are shown, and then some in which the miracidia are trying to break the shell. In the next scenes some of them succeed in doing so, and the miracidia shoot out. One of them obligingly goes through this process at very slow speed. The rest of the film shows their changing shapes and how the miracidia move around in their search for a snail, (Figure 3). Motility is seen to be due partly to large numbers of cilia, and partly to bodily movements. These bodily movements are also responsible for the curious changes in shape mentioned. The film does not give a complete life history of the parasite, but it illustrates the points that are diagnostically important.

4. *Growth of yeast cells.* This is a time-lapse film, taken at a speed of one frame every 15 seconds. Shown at the ordinary speed of 16 frames per second, the happenings are apparently speeded up 240 times.

In other words the 100 feet film shows in about 4 minutes what in reality covered a period of 16 hours. Budding takes place through a small portion of existing cell-wall rather suddenly giving way and pushing out a thin bubble. In some cases the budding cell seems to show signs of internal stress by becoming elongated. Through the pore between the old cell and the bubble small particles rush from the old cell to the new, and plaster the bubble wall until it reaches ordinary thickness. Then the pore closes and the cells separate, often with a jerk, and the process is repeated. In one instance one cell gives rise to nine new ones. Figure 4 shows two budding cells.

5. *Balantidium coli.* Dysentery caused by this microbe is on the increase, and once the parasite has been seen in its characteristic restless waltzing motion, it is not easily forgotten. Figure 5 is a copy of a single frame. The film shows large numbers in a drop of liquid stool, and the funnel-shaped mouth and the cilia are clearly seen. For the sake of comparison, and to emphasize the different patterns of motility, the second half of this film is taken up by some shots of endamoeba histolytica in a drop of liquid stool. This primitive form is at first shown alone in the field, so as to introduce the student to its characteristic shapelessness, and its slow pseudopodial movement. The difference between the clear ectoplasm and the granular endoplasm is manifest. Further on endamoebae are shown in the midst of masses of debris, where they are more difficult to spot. The free movement of phagocytosed red blood cells in the body of the amoebae is specially pointed out.

6. Surface growth of *sporotrichon* fungus on agar. This is not really a cine-micrographic film. It was made by placing a film camera with a short distance objective over an open petri dish with Sabouraud agar, on the surface of which sporotrichon spores had been planted in the shape of a cross. Pictures were then taken at intervals of one minute for four days. The apparent speeding up of growth on the screen therefore is 960 times. At the start the film shows a bare agar surface, after about one day the appearance of Figure 6 is reached. As the total film in 4 days became 140 feet long, 40 feet had to be cut out and one whole day's growth was taken out somewhere in the middle. The second half of the film shows the more interesting developments. The tough membranous growth obviously in its continuous expansive growth has no choice but to lift itself from the agar surface. This leads to the formation of irregular wrinkles of the membrane, and so the characteristic rugose appearance of a sporotrichon culture, including the serrated edge, is gradually reached. Figure 7 is a copy of a frame near the end. As

the petri dish had to be left open all the time, contamination by molds did occur and these are visible at the edge of Figure 7.

## SUMMARY

A description is given of six 100 feet 16 mm. silent films dealing with motility and growth of various microbes. They are intended for educational purposes.

## ACKNOWLEDGEMENTS

I wish to thank Mr. A. F. Mackenzie, honorary librarian of our Pretoria Cinema Club, for teaching us how to make titles, and my secretary, Mrs. A. E. Brummer for making all the titles and for much valuable advice in putting together these films.

## NOTE

A duplicate of each of these 100 feet films can be had at cost price from the author, and a duplicate of each one has been presented to Professor Harry E. Morton, Chairman of the Committee on Materials for Visual Instruction in Microbiology, Society of American Bacteriologists, University of Pennsylvania, School of Medicine, Philadelphia 4, Pa., with whom arrangements can be made for their use.

### REFERENCES

1930 Cbl. Bakt., Abt. I, Orig., 118, 113.
1931-32 Cbl. Bakt., Abt. I ,Orig., 123, 195.
1938 J. Pathol. Bact. 47, 1.
1940 J. Biol. Photo. Assn., 8, 158.
1942 J. Biol. Photo. Assn., 11, 65.

## BOOK REVIEWS

**THE ELECTRON MICROSCOPE by Dr. D. Gabor. Chemical Publishing Co., Brooklyn, New York. 164 pages, $4.75.**

The introduction of the electron microscope has permitted substantial improvement in the solution of structural problems in the fields of medicine, chemistry, biology and genetics. The new technique has aroused considerable interest and is increasingly applied. This book by Dr. Gabor is therefore very timely and deserves to be well received by all scientists who would like to be informed in a clear and practical way of the fundamentals of electronic optics and of the basic operation of the different types of the instrument.

The subject is clearly presented with a minimum of mathematical developments. The description of different desk and industrial models of the instrument follows introductory remarks on the theory of electronic microscopy which are then more fully developed in the course of the second part of the manual. The preparation of the specimens and the use of the instrument are clearly described. Possibilities and limitations of the method are critically revised from a theoretical point of view. Particularly interesting is a short chapter illustrating the newly studied proton microscope which could eventually reduce the present resolution limit of 8 A to a value of 1 A. The bibliography is limited but well selected.

MARIO STEFANINI, M.D., Ph.D.

**MANUAL OF VETERINARY CLINICAL PARASITOLOGY by E. A. Benbrook and Margaret W. Sloss. The Iowa State College Press, Ames, Iowa. Price $4.50.**

This 187 page illustrative book of parasites has 247 figures, 240 of which are photographs. The microscopic photographs are of such excellent clarity that no imagination is allowed when comparing them with parasites one wishes to identify from the specimen at hand.

The book is divided into three parts. The first part enumerates the apparatus and material necessary for the collection and examination of feces and describes various steps in performing the examination, some of which are illustrated by photographs. This is followed by 156 photomicrographs of ova, larvae and various objects mistaken for ova (pseudoparasites). The legend of each figure is brief and to the point.

The second part follows the same pattern as the first. It outlines, classifies and describes the common mites by word and picture.

The third chapter describes the biting and sucking lice of domestic animals.

The book is recommended to all interested in parasitology. The reviewer recommends this handy volume be added to the armamentarium of every veterinary physician.

S. B. PESSIN, M.D.

**THE AMERICAN ANNUAL OF PHOTOGRAPHY Vol. 63, 1949, edited by Frank R. Fraprie and Franklin I. Jordan. 240 pages of text—4 pages of advertising. American Photographic Publishing Co., Boston, Mass.**

The past-president of the Royal Photographic Society leads off with an interesting illustrated article on the late Alexander Keighley, Hon. FRPS, and his art, one of the world's great in Pictorialism. Yousef Karsh's "Photographs of Famous Musicians" illustrates the virtuosity of this master portraitist. Georgia Englehart, a wonder-worker with children, tells "how" in "Photographing Small Fry".

One article that should interest our members is by Alda Jourdan,—entitled "Plant Portraits". The illustrations shows fine artistic flower arrangements, and most of us have a lot to learn in this phase of biological photography.

Eleanor Parke Custis, the famous pictorialist, handles a "hot" subject in great style. It is called "Sharpness and Pictorialism". It is well illustrated with reproductions of many of her winning Salon prints.

The department "Who's Who in Pictorial Photography" for 1947-48 is a *must* for any pictorial worker, with its listings and ratings of pictorialists in this country and abroad.

This volume contains 84 pictorial illustrations, selected annually from world-wide exhibitions. There are quite a number of other worthwhile articles, a table of contents, list of pictorial illustrations, and an index of advertisers.

RAY MIESS

**THE NEGATIVE by Ansel Adams. Published by Morgan and Lester, 101 Park Avenue, New York 17, N.Y.**

Illustrated with 41 of Ansel Adams original photographs and 21 informative diagrams and tables. 118 pages of text-table of contents and cross index of subject matter.

Again, as in Book 1, Mr. Adams has made an approach to a technical subject that is to be commended for its clarity, and everyday "horse sense". His darkroom procedures are sound and elementary, and his story of Compensating Developers, Pre-exposure, etc. can be understood by anyone having sufficient interest to read this book. He "exposes for the shadows, and develops for the highlights"—not by guessing, but with the most intelligent and precise use of the exposure meter, that we ever have seen described in any other author's work.

To read about the method of "placement of values on the exposure

scale" is revealing of the exacting precision that characterizes all of Mr. Adams' photography.

This is the second volume of a projected series of six. The publishers assure us that the other four will follow at regular intervals in the near future.

RAY MIESS

**THE YEARS PHOTOGRAPHY, 1948-1949. A Royal Photographic Society Publication. Official record of the Society's 93rd Annual Exhibition, London, England.**

The arrival of this small, but beautiful annual always means an evening of pleasure. Reading it, and writing a review really becomes a "labor of love". This issue is as usual, up to previous standards, containing 41 illustrations of selected prints, all chosen with excellent taste. There is an expert review of the Pictorial prints by W. R. Kay, FRPS.

The interesting review of the department of Nature Photography is written by the world famous nature photographer, Oliver G. Pike, FRPS, and the lantern slides are ably described by Anne Jackson, FRPS.

This Annual is printed for the members of the Royal Photographic Society.

RAY MIESS

## For Sale

Leica III-C, Summar 5 cm. f.2 lens, leather case. The camera has shutter speeds from time to 1/1000th second and a coupled range finder.

Leitz filter, Type A daylight

Leitz cable release and sunshade

Leitz micro-isbo with 10X eyepiece and 2 release cables

Retaining ring for mounting Summar lens to enlarger

The entire lot is in excellent condition and may be purchased for $300. If interested, contact Russell F. Culbertson, 7317 North Boston, Portland 3, Oregon.

# Letter Height in Relation To Legibility on Standard Lantern Slides

**Robert A. Sage, F.B.P.A.**

REDUCTION of typed or lettered data on charts and graphs is a process encountered almost daily by many biological photographers. Two excellent papers on this subject, by Hewitt[1], and by Maurer[2], have discussed the problems and optical laws involved, and have offered methods for handling data destined for reproduction on lantern slides. Illegibility due to reduction is not confined to lantern slides alone. Reduction in letter size almost always occurs upon reproduction in various journals, and in many instances the printed graph occupies an area less than 3¼ by 4 inches. In some journals, e.g., The Journal of the American Medical Association, where space is at a premium, graphs originally legible are reduced to rather small proportions.

Waters[3] has called attention to the increased emphasis which letters of greater line-thickness, or stroke-width, give to the main titles of charts and graphs. Where special attention also must be drawn to specific areas of graphs, heavy, bold letters naturally fix the attention of the audience on these areas. The person who originally draws the chart or graph often seems unable to jump the psychological gap between the full size chart on which he is working, and the reduced form in which it finally appears, whether on a lantern slide or in a journal. While it is not the purpose of this paper to suggest letter style, room for improvement in this respect is obvious. Table I illustrates examples of the Leroy Lettering Guides*, both in height and stroke-width. Schmidt[4] called attention to applications of these lettering guides in a previous paper. The selection of an attractive and legible height and stroke-width requires skill, judgment and experience. Some fine examples are available in better advertising lay-outs, and charts in medical exhibits, on lantern slides and in journals can profit by a judicious use of bold lettering. The

Received for publication August 31, 1948 from the Department of Medical Art and Visual Education, Southwestern Medical College of the Southwestern Medical Foundation, Lewis Waters, Professor of Art as Applied to Medicine and Chairman of the Department.

* Made by Keuffel and Esser Company, New York.

# TABLE I

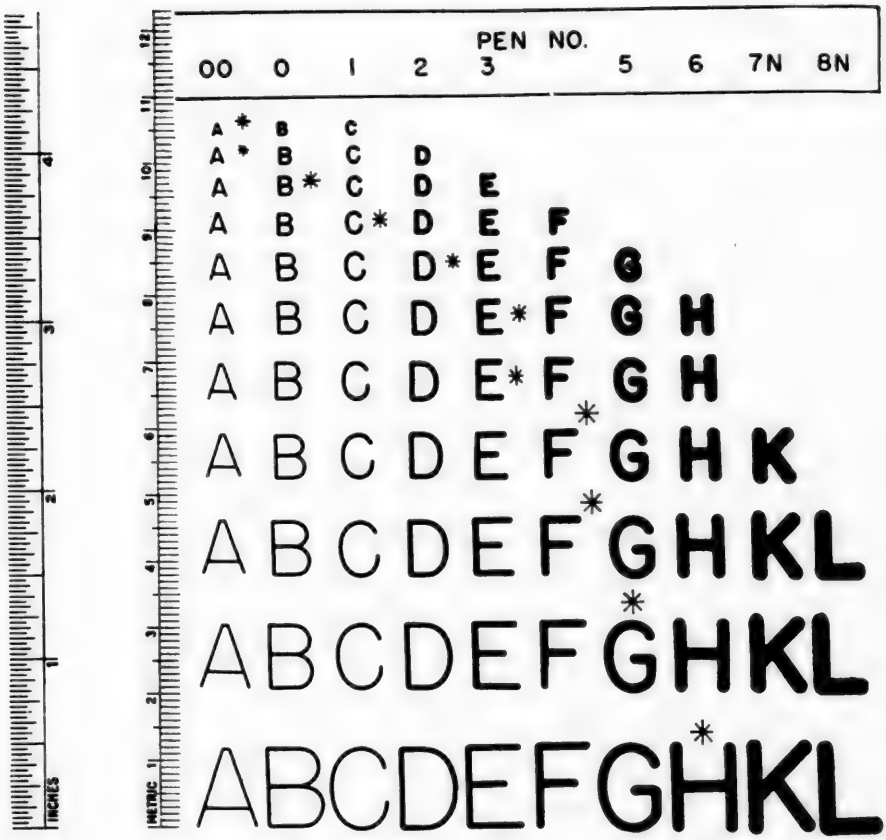



**Table 1. The above chart shows the ride range of Leroy lettering effects that can be produced by combining various Leroy templates and pens. * Indicates the combination of template and pen recommended for a good proportion between the thickness of stroke and the size of letter.**

reverse is seen on maps and architectural drawings. Here, the letters often average 3 mm. in height, and are of fine stroke-width. When these microscopic letters are compressed on a lantern slide, the resolving power of the copying lens, the film, and the eyes of the audience are strained to the utmost.

It is the purpose of this paper to present a simple scale for determining in advance the proper letter height for assured legibility on charts

and graphs intended for use on the standard lantern slide of 3¼ by 4 inches. Letter height is selected because it is a convenient dimension to measure, and differences of 0.5 mm. are discernible with the ordinary metric scale. The scale applies also to numeral height. The width of the letter and stroke-width usually increase as the height increases in commonly used letter styles. Before selecting letter styles for typewriters and lettering guides, it is advisable to run a few tests and see the effect of extreme reduction on the letters. Watch particularly for the tendency of closed letters, such as "a" and "e" to plug, or fuse into indistinct dots.

TABLE II

MINIMUM LETTER HEIGHT ON CHARTS AND GRAPHS PERMITTING LEGIBLE REDUCTION TO LANTERN SLIDES OF 3¼ x 4 INCHES

| DIAGONAL OF CHART IN INCHES | LETTER HEIGHT IN MILLIMETERS |
|---|---|
| 13 | 3.0 |
| 16 | 3.5 |
| 18 | 4.0 |
| 21 | 4.0 |
| 23 | 4.5 |
| 26 | 5.0 |
| 28 | 5.5 |
| 31 | 5.5 |
| 34 | 6.0 |
| 36 | 6.0 |
| 39 | 7.0 |
| 41 | 7.0 |
| 42 | 7.5 |
| 47 | 8.0 |

*Experimental:*

The booklet containing sample letter styles and sizes of the Leroy Guides and Adjustable Scriber, was chosen because the same style letter appears in increasing height on the same page. This page, Table I, and another page containing sentences appearing in different heights, were copied on Kodalith Ortho film, and a glossy print, 5 by 7 inches was made of each. Each line of letters was given a key number of large size, and a record kept of the letter height in millimeters of each line.

Three chart sizes were selected, conforming to the rectangular proportions of the lantern slide: 8¼ by 10, 14¾ by 18, and 21 by 26 inches. The two 5 by 7 prints were placed in the centers of each of the three rectangles, and a copy negative made of each. Then a lantern slide was made by projection from each copy negative, and the full area of the lantern slide plate, except that masked out by binding tape, was utilized.

Six medical students, each with proved 20/20 vision were told the purpose of the test, and were cautioned to list only the smallest line of letters which they could discern quickly and without eye-strain. Three of these students sat in the auditorium 30 feet from the screen, and the remaining three sat on the back row, 60 feet from the screen. The test lantern slides were projected for intervals of about 15 seconds each to permit time to record the key number on the screen. Three members of this Department were also given a separate test, and the results for all tests were averaged. A graph was then made plotting letter height against the diagonal of chart size, and the figures obtained for letter height were rounded off to the nearest 0.5 mm. These figures for letter height are the *minimum* for legibility for the corresponding chart diagonal. It is always better to use letter heights in excess of those given, if space permits. The simplified data is given in Table II.

*The Room:* Image factor in our auditorium, according to Maurer's method[2] is 6.6 to 1, where the full usable area of the lantern slide is filled with data. Auditoriums seating more than 250 persons may easily require a corresponding increase in letter height. Table II is intended as a guide, and is not designed for extreme conditions. It should, however, meet the needs of the average auditorium found in medical schools. It is assumed that the screen is of good quality and adequate size, and the projection machine is efficient. A 10 by 12 foot "Da-lite" beaded screen and a Spencer Delineascope, model GK, 750 watts, were used in this experiment. The distance from projector to screen was 63 feet.

The scientist or doctor who brings in a highly overcrowded chart is often reluctant to simplify or condense his data. In some instances, this

is undesirable, and there is often little time for elaborate arguments about legibility. In our experience, few lecturers take time to consider the effect of their slides on that part of the audience seated in the rear of the auditorium. The problem is usually left with the draftsman and the photographer, and its solution depends on their understanding and cooperation. The writer wishes to repeat the warning given by Maurer[2], "The audience will not struggle to read material which is at the limit of legibility. Make your copy better than just legible."

Hewitt[1] has called attention to the irregular edges of typed data on lantern slides. Most machines using a cloth ribbon produce this kind of letter. More recently, electric typewriters with carbon paper ribbon attachments have been available. Some of these machines are comparatively costly, but they produce very high-grade copy when carefully adjusted. Some standard noiseless typewriters will accept the carbon ribbon, and this technic is well worth a few experiments. Ordinary typewriters, with uncontrolled key-stroke, will usually break a carbon ribbon. Another well-known method is removing the cloth ribbon and typing through the back of a hard carbon paper. The surface of the paper used is important. Sized stock, or light-weight Strathmore drawing paper is better than the rougher surface of "bond" paper. These methods are suggested where speed in producing copy is important. Larger legends require hand lettering, lettering guides or similar methods.

The primary purpose of a lantern slide of scientific data is to convey information clearly, rapidly and without eye-strain. It requires very little extra effort for the draftsman and the photographer to fulfill their part of the bargain.

[1] Tabular and Textual Lantern Slides, by Richard M. Hewitt, Jour. Biol. Photo, Association, 5, 4, June 1937. p. 167 ff.

[2] Practical Lantern Slide Projection, by John A. Maurer, Jour. Biol. Photo. Association, X, 3, March 1942. p. 123 ff.

[3] Lewis Waters, Personal Communication.

[4] Practical Methods of Lettering, by Louis Schmidt, Jour. Biol. Photo. Association, X, 3, March 1942, p. 130 ff.

# News From the Trade

## PRC PROJECTOR NOW DISTRIBUTED BY LABELLE

LaBelle Industries, Inc., Oconomowoc, Wis., has acquired all sales rights to the PRC automatic slide projector, formerly distributed by the Picture Recording Company, Chicago.

This unit, which has been known to the trade as Model 300 PRC, is now identified as LaBelle Model 301 Automatic Magazine Loading Slide Projector.

In operation, the new LaBelle is different from any other projector in existence. It does all feeding, changing and restacking of slides automatically, efficiently and in perfect order. A push-button switch on a remote control cord gives real advantages to the operator, who can stand in front of his audience if giving a lecture, or relax comfortably in an easy chair, away from the projector.

A metal magazine, loaded with either 75 two-by-two ready mounts or 35 glass slides, is inserted into the top of the LaBelle projector. Pressing the control switch releases the slides, one at a time, into a special chamber where they are prewarmed and conditioned for the heat in the projection aperture. The pre-warming operation prevents warping or buckling and insures correctly focused projections.

Each slide moves automatically into the right position in the projection aperture. A superior optical system increases light intensity and projects the image through coated lenses that reduce reflections. The image appears on the screen in sharp detail, always in perfect focus, and remains there until the pushbutton is operated again.

A double-action shutter completely blocks out the picture on the screen when slides are changed. A new view appears instantly, without flickering or the usual slide "wipe."

After leaving the projecting aperture, all slides, kept in correct sequence and proper position, are automatically restacked in an interchangeable metal container at the bottom of the machine. This container, when removed from the projector after an exhibition, can either be inserted into the top for another showing or filed for future use.

The LaBelle Projector makes it unnecessary to handle slides or ready mounts after they are once arranged, and they remain free of fingerprints or scratches. The objective lens is controlled by a "micro-focusing" adjustment. The "micro-tilt" quickly adjusts the alignment of the projected image on the screen.

E. LEITZ, INC., announces that designs for a special type of copying apparatus have been completed and will be in production shortly.

The "Tricoplat," a rotating stage plate accepting three Leica Cameras, has been designed primarily for macro and micro medical photography. This new accessory eliminates the changing of cameras when photographing the same specimen in rapid sequence, on color film, black and white film, and reversible positive film.

There has also been an increasing demand for the "Tricoplat" by color plate engravers, for the quick and accurate production of three monochromatic separation negatives from the original 35mm. color transparency.

## 152MM. F/4.5 LENS FOR 4 BY 5 CAMERAS ADDED TO KODAK EKTAR LENS LINE

To fill the need for a longer focal length lens of Kodak Ektar quality for 4 by 5 cameras, the Eastman Kodak Company has announced a Kodak Ektar Lens, 152 mm. (6-inch) f/4.5.

The new Kodak Ektar Lens, 152 mm. f/4.5, has greater maximum aperture than the Kodak Ektar Lenses heretofore used with 4 by 5 cameras. The new lens also provides greater covering power which will be helpful when making use of camera tilts, swings, and rising and falling adjustments at close working distances. This lens is intended for all types of general picture making and, like all preceding lenses of the Kodak Ektar Lens line, is particularly well-suited for color photography.

The Kodak Ektar Lens, 152mm. f/4.5, is mounted in a new No. 3 Kodak Flash Supermatic Shutter which provides flash synchronization at speeds from 1 second to 1/200, plus "time" and "bulb." All air-exposed surfaces of the lens are Lumenized with Kodak's extra-hard lens coating to assure the photographer maximum clarity and brilliance in both black-and-white and color work.

The lens diaphragm openings range from f/4.5 to f/32. A synchronizer cord and No. 5 (7-inch) Kodak Cable Release are regularly supplied with the lens.

## WHY MIX A GALLON WHEN 8 OUNCES WILL DO?

Thanks to the ingenuity of men who know how troublesome it can be to mix a gallon of this, or a half-gallon of that, to develop a couple of rolls of film or to turn out a few small prints, life is going to be easier for photo fans everywhere. They're going to save money, too,

since no longer will they have to mix more developer, short stop, or fixer than they need for the work at hand.

This somewhat revolutionary approach to the problem of photographic supply and demand was brought about this week by the introduction of a new package of photographic chemicals which provides in one inexpensive unit all the materials necessary to prepare all the developer, short stop, and fixing bath required to develop and fix two rolls of No. 620 film or 50 prints from 2¼ by 3¼-inch negatives or equivalent.

Manufactured by the Eastman Kodak Company, the new unit is known as the Kodak Tri-Chem Pack. Each pack, priced at only twenty cents, contains heat-sealed aluminum foil packets of chemicals to make 8 ounces of Kodak Universal M-Q Developer, 8 ounces of Kodak Universal Stop Bath with indicator, and a similar amount of Kodak Universal Fixer.

By using solutions prepared with the new pack, picture takers who only occasionally develop and print films will be money ahead over the purchase of larger unit packages of chemicals since they will not be wasting solutions through discarding chemicals before they have been used to full capacity. In addition, this new pack eliminates the need for many storage bottles in the darkroom, and workers can be certain that they are always using fresh chemicals at full strength. The packets of chemicals in the new unit will remain fresh without deterioration for an unlimited period.

The new packets are practically mistake-proof. Full directions are included, but all that is necessary is to tear the corner from a packet, mix with the specified amount of water, and the solution is ready for use.

# Two Methods of Producing Excellent Lantern Slides from Kymographic Records

**Robert D. Wolf***

THE chief difficulty in producing slides from kymographic records is the contrast between the enormous record and the small lettering used in annotating it.

Step one of the first method of slide-production is to cut the record into sections not more than 36 inches long and then to make a photostatic copy one-half the original size. This procedure is followed with all of our records. The photostatic copies, measuring 14 by 19 inches, are then filed in a book 14½ by 20 inches. This copy is a negative and the next step is to produce a positive by recopying. Then on the positive, with lamp black water color or India ink, all the information which was written in by hand during the experiment is blacked out. The positive or second photostatic copy is then ready to be copied again. This is the negative or the third photostat. On this copy the information which is needed for the slide is printed with the LeRoy lettering set. For the slide shown in Figure 1 template No. 240 of the lettering set was used. The original record was 34 inches long and the first copy was reduced to 17 inches. The second and third copies were not reduced and therefore it was necessary to use template No. 240. The fourth and final copy was reduced by one-half and this record was 8½ inches long. This is a convenient size for filing, and very easy to copy with the camera for the lantern slide.

The second method of producing slides involves the use of the typewriter instead of the LeRoy lettering set. The procedure followed is the same as that described for the first method except that by the time the third photostat has been made, the copy should be about 6 inches in length. This type of record is shown in Figure 2*, which was reduced to 5 inches in length and then the necessary information typed in.

* Photographer, Ciba Pharmaceutical Products, Inc., Summit, New Jersey.

Received for publication October 22, 1948.

[1] From the paper of F. F. Yonkman, entitled "Pharmacology of Demerol and Its Analogues", presented at the Conference on Newer Synthetic Analgesics, New York Academy of Sciences, 1948, to be published.

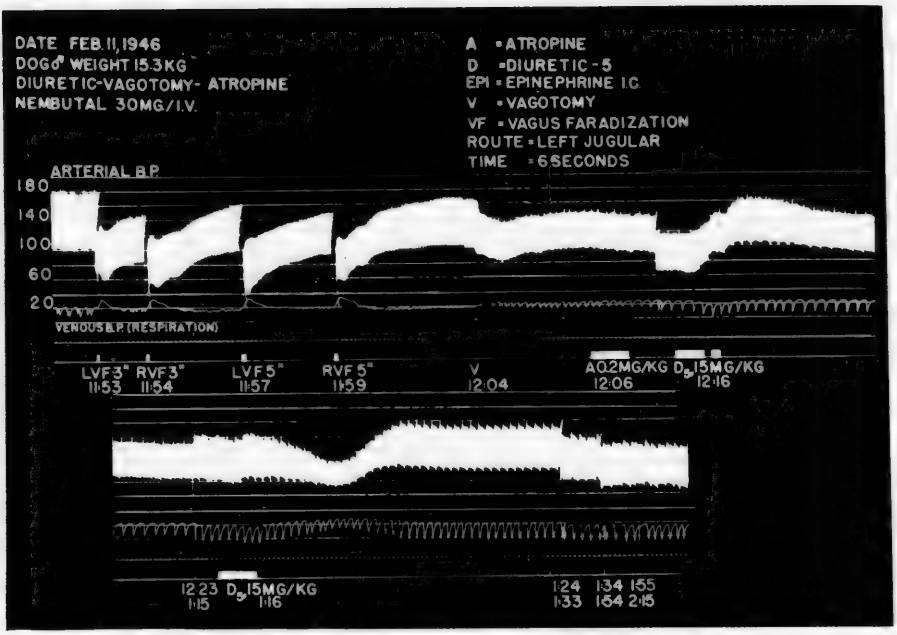



Figure 1.

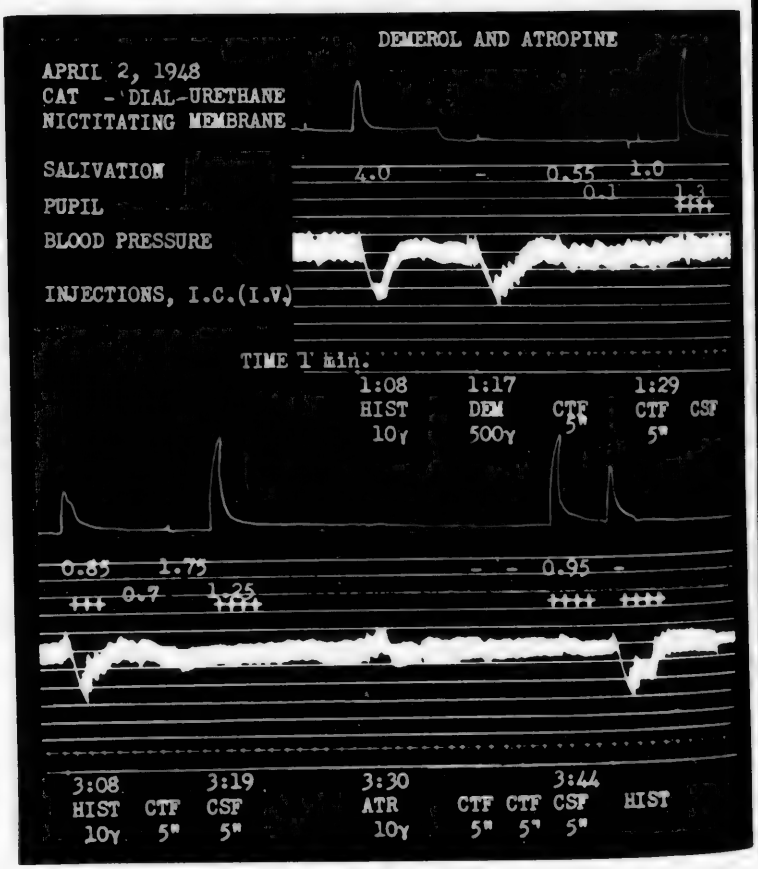



Figure 2.

The typing on such photostatic copies has a gray appearance due to the emulsion on the paper and therefore it must be gone over a second time time to make the copy as black as possible, and that was done in preparing the slide shown[1] (Figure 2). Then too, care must be taken with the paper as it will smudge very readily. The typing greatly reduces the amount of time required to produce a slide. Often such slides are needed in a very short time and one must resort to the speediest method. When possible, preference is given to the first method, that is, using the lettering set, because the finished product is superior.

To produce slides in this manner may seem to involve an endless amount of copying and recopying, but in our laboratories the first copy is always made for the record book and it is possible to omit the fourth copy and show the material as a negative and not as a positive.

A lecturer who spends hours on the preparation of his paper finds good slides a most essential part of his presentation. If the paper is to be published, then additional benefit is derived from this procedure.

---

## BPA Local Chapter Secretaries

| | |
|---|---|
| Boston | Laurence B. Brown<br>Harvard Dental School<br>188 Longwood Avenue<br>Boston 15, Mass. |
| Chicago | Maria Elsasser Ikenberg<br>832 Gunnison Street<br>Chicago 40, Illinois |
| Cleveland | Fred S. Beal<br>St. Luke's Hospital<br>Cleveland 4, Ohio |
| Los Angeles | Avis Gregersen<br>Department of Dermatology<br>Southern California School of Medicine<br>Los Angeles 33, Calif. |

# Contributing Members

Dr. S. Glidden Baldwin
139 Vermilion Street
Danville, Illinois

Dr. E. C. Baker
Youngstown Hospital
Youngstown, Ohio

Dr. Dennistoun M. Bell
"Broadview"
Amagansett, N.Y.

Dr Tibor Benedek
25 E. Washington Street
Chicago 2, Illinois

Lester V. Bergman
732 Eastern Parkway
Brooklyn 13, N.Y.

J. D. Brubaker
805 Greenleaf Street
Evanston, Illinois

Dr. W. A. "Don" Cammon
Cameron Surgical Specialty Co.
666 W. Division Street
Chicago 10, Illinois

Ralph P. Creer
American Medical Association
535 N. Dearborn Street
Chicago 10, Illinois

Dr. Edmond J. Farris
The Wistar Institute
Philadelphia 4, Pa.

Louis Paul Flory
Boyce Thompson Institute for
Plant Research
Yonkers 3, N.Y.

Dr. A. Wilson Footer
2828 Summit Street
Oakland 9, Calif.

Marjorie E. Francis
Visual Research Company
30 N. Dearborn St
Chicago 2, Ill.

Dr. Jay M. Garner
723 Elm Street
Winnetka, Ill.

H. Lou Gibson
Eastman Kodak Company
Rochester 4, N.Y.

Fort B. Guerin
6310 Delmar Blvd.
St. Louis, Mo.

Dr. Paul H. Holinger
700 N. Michigan
Chicago 11, Ill.

Dr. J. P. Juhel
St. Francis Hospital
Cincinnati 14, Ohio

Victor R. Landi
8211 Grove Street
Silver Spring, Md.

Henry M. Lester
101 Park Avenue
New York 17, N.Y.

Dr. Robert Mallory III
169 Milton Road
Rye, N.Y.

Dr. Geo. Matula
105 W. Adams St.
Chicago 3, Illinois

John A. Maurer
c/o Ansco
247 E. Ontario St.
Chicago, Ill.

Stanley J. McComb
Mayo Clinic
Rochester, Minnesota

Ray Miess
1810 N. Farwell Ave.
Milwaukee 2, Wis.

Henry W. Morris
Medical School Photo Lab.
Univ. of Minnesota
Minneapolis 14, Minn.

Leonard L. Perskie
Graphic Studios
231 - 10th Ave.
New York 11, N.Y.

Dr. Arthur W. Proetz
1010 Beaumont Bldg.
St. Louis 8, Missouri

Frank N. Ruslander
Harper Hospital
Detroit 1, Michigan

Albert Sadler
Wayne County General Hospital
Eloise, Michigan

Anne Shiras
University Office
Magee Hospital
Pittsburgh 13, Pa.

William J. Taylor
Temple University Hospital
Philadelphia 10, Pa.

Lloyd E. Varden
Pavelle Color, Inc.
533 West 7th Street
New York 19, N.Y

Julius Weber
425 West 263rd Street
Riverdale 63, N.Y.

# Association News

## Eighteenth Annual Meeting of the B.P.A. Philadelphia, Pa. September 8-10

The Philadelphia Meeting was held at Houston Hall, under the auspices of the University of Pennsylvania. 199 registered. 39 guests saw the exhibits and attended one or more of the sessions. The others attended the sessions with the consistent interest which is typical of our meetings, so the meeting room was well filled. The total registration topped our previous record (Rochester, 1947) by 38. 88% were from New England, the Middle Atlantic States and the Great Lakes Section. Several came from distant states of California, Utah, Colorado, Texas, etc. Every major section of the country was represented except the Pacific Northwest.

The good work of the Convention Committee was reflected in one of the most successful and well organized meetings. Dr. Harry E Morton, University of Pennsylvania, was general chairman. Harold Baitz was in charge of the program; Frank Kootcher of the Salon; William Taylor of the commercial exhibits; Richard Burton of projection and equipment, and Robert Chapman of registration. Each committee member cooperated actively in the work of the other members. Their mutual sharing of responsibility made easier the installation of the exhibits, and kept the sessions running smoothly. Dr. Farris, although his name did not appear among the committees, was active in coordinating plans, and in helping to introduce several interesting innovations.

One of these new features was a more liberal use of symposia and demonstrations than we have attempted before. On Wednesday afternoon, September 8, a "Demonstration of Clinical Photography" was given by William Payne, FBPA. He photographed a model by his flash method for a department which must produce a large volume of clinical pictures. After taking a variety of negatives, Mr. Payne processed them and the prints were examined and discussed on Friday afternoon by the group.

Four symposia were held:

"Lantern Slides and Copying" Chairman, Charles S. Foster, Wednesday, September 8, 4:00 P.M.

"Motion Pictures" Chairman, Harris Tuttle, Thursday, September 9, 2:00 P.M.

"A Clinic on Biological Motion Pictures. Subject: Film Types: Their Nomenclature, Classification and Methods of Production" Speaker: David S. Ruhe, M.D., Thursday, September 9, 8:00 P.M.

"Photomicrography" Chairman, Dr. Oscar Richards, FBPA, Friday, September 10, 2:00 P.M.

The symposia on "Lantern Slides" and on "Photomicrography" opened with prepared papers by several speakers, followed by general discussion. The afternoon symposium on motion pictures consisted of open discussion and questions-and-answers; at the evening session Dr. Ruhe gave a talk on film types illustrated by excerpts from various films.

Since the afternoons were devoted to the symposia, formal papers were scheduled only in the morning. The contributors of these eleven papers had submitted abstracts during the summer, which were available to members in the form of a leaflet printed by the Wistar Institute Press. The papers were:

"Control of Highlights in Photography of Gross Specimens." John Beiter, FBPA, Milton Bohrod, M.D., Harold Thomas.

"A Variable Control X-Ray Illuminator and Copy Stand." Albert Sadler, FBPA.

"Catatonic Immobilization of Laboratory Animals for Photography." Albert R. Latven.

"A Versatile Photomicrographic Camera." John V. Butterfield.

"The Lifwynn Eye-Movement Camera." Trigant Burrow and Hans Syz. (Introduced by Henry Roger, FBPA).

The Use of Biological Photography in Bacteriology." Dr. Harry E. Morton.

"Medical Education and the Motion Picture," Warren Sturgis.

"Intra-Oral Photography, the Value of Correct Patient-Photographer Relationship." Harold Thomas, John Beiter, FBPA.

"Career Potentialities Through Centralization." Arthur Smith, FBPA.

"Preliminary Studies of Human Carcinoma with the Polaroid Color Translation Ultra-Violet Microscope." Dr. Robert Mellors.

"The Society of Photographic Engineers." Gerald Badgley.

Motion pictures were an important feature of the meeting. Besides symposia listed above, there were three sessions at which films selected from the Motion Picture Salon entries were projected. And an hour of the program on Friday morning, Sept. 10 was devoted to:

"The Medical Motion Picture—Its Development and Present Application," a historical film made for the American Medical Association by Ralph Creer, FBPA.

"Naval Photography in Science" a film from the Naval District Headquarters.

During the meeting, a questionnaire was circulated by Dr. Oscar Richards, requesting the members' comments on the value of the various types of presentations (papers, symposia, demonstrations, etc.) and asking for suggestions for future meetings.

*Commercial Exhibits*—Equipment shown was interesting and made one feel that production is at last beginning to catch up with our needs. New cameras, accessories, photomicrographic equipment, and precision 16mm. motion picture equipment were on display, as were photographic emulsions (particularly for color-work). Participating firms were:

Ansco
Bausch & Lomb Optical Co.
Eastman Kodak Co.
Gamma Instrument Co.
J. A. Maurer, Inc.
Williams, Brown & Earle, Inc.

*Salon*—National Salon Chairman, Nathan Horton, FBPA submits the following report:

"The Philadelphia Committee is to be congratulated on the excellent layout and general appearance of the 1948 Salon. The prints were well arranged on large easels, with ample room for viewing. Transparencies were also well arranged on convenient tables around the room. The fact that the Salon and the Commercial Exhibits were in the same room resulted in this area being well patronized.

"A total of 190 prints were hung; 21 were color prints and for the statistically minded, the following is a breakdown of subject matter in black-&-white and in color.

| | | |
|---|---|---|
| "Miscellaneous clinical subjects | 51 | (6 in color) |
| Gross specimens | 22 | (11 in color) |
| Photomicrography | 53 | (2 in color) |
| Photomicrography—grenz-ray | 15 | |
| Ophthalmology | 19 | (2 in color) |
| Instructional | 8 | |
| Entomology | 2 | |
| Zoology | 2 | |
| Ornithology | 1 | |
| Botany | 1 | |
| Miscellaneous subject matter | 16 | |

"As in past years, the greatest number of prints were classed as photomicrographs, but such a bald statement of fact does not do justice to the remarkable variety of micrography which was exhibited. Several of those who viewed the Salon expressed the opinion that the standard of the photomicrographs was exceptionally high.

"A large number of transparencies in color were exhibited—a total of 454, running in size from 35mm. to 11″ x 14″. The statistics regarding such would be rather involved but it might be noted that the majority of the transparencies were of clinical subjects or gross specimens. Included in the total however was a series of beautiful transparencies on marine life—approximately 170. As might be expected, the majority of the transparencies were in 35mm. size but the beautiful exhibit 'Sludged Blood' (which originally appeared in Life Magazine, May 31, 1948) was made up of 30 8″ x 10″ transparencies.

"Generally speaking the Salon was of very high quality and represented an outstanding exhibition of scientific photography."

## SOCIAL EVENTS

The speech of welcome which opened the sessions at 10:00 A.M. Wednesday, September 8 was given by Dr. John McK. Mitchell, Dean of the School of Medicine, University of Pennsylvania.

After the evening motion picture session at Houston Hall, a smoker was held at the Wistar Institute. This early gathering was one of the meeting's innovations. It gave the members an opportunity of talking with one another; of renewing old friendships and making new ones.

At the official luncheon held next day in Houston Hall, Mr. Louis Walton Sipley of the Museum of Photography in Philadelphia spoke on "A Functional Museum of Photography."

On Friday evening, September 10, the members were guests of the Eastman Kodak Co. for an enjoyable cocktail party at the Hotel Penn Sheraton. The Annual Honors Award Dinner took place afterwards, at Houston Hall. The speaker of the evening, Mr. Lloyd Varden, FBPA, gave a talk on "Visual Factors in Phtoagraphy." At this dinner the 1948 Fellowships, the Salon and motion picture awards, and the Annual Award (which is a new honor given this year for the first time) were announced by Dr. Farris. All the awards created interest. In particular, Dr. Farris's eloquent announcement of the Annual Award met with heartfelt enthusiasm. There was probably not one person present who dissented with the Board's choice, or who felt anything but sincere

pleasure at this recognition of the individual who has contributed most to biological photography.

## ANNUAL HONORS AWARDS

*1948 Fellowships*—Two members were made Fellows of the BPA:

Mr. Allen Hancock
Jefferson Hospital
Philadelphia, Pa.

Mr. Harris Tuttle
Eastman Kodak Co.
Rochester, N.Y.

*Salon Awards*—The Jury consisted of Leo Massopust, Chairman, John Butterfield, Frank Ruslander and Harris Tuttle. Except in the case of the Color Print, where only one award was given, a blue ribbon was affixed to the first award in each class, and a red ribbon to the second award. The ribbons had been given earlier in the day so that Salon visitors could see the winning entries.

*Photomicrography:*

1st: Albert Sadler FBPA
Eloise Hospital
Eloise, Mich.

2nd: J. W. Crunelle
University of Chicago
Chicago, Ill.

*Gross Specimen:*

1st: Chester Reather
Carnegie Institution of Washington
Baltimore, Md.

2nd: Charles Reiner
Highland Hospital of Rochester
Rochester, N.Y.

*Nature:*

1st: H. L. Gibson FBPA
Eastman Kodak Co.
Rochester, N.Y.

2nd: Howard Kothe
The Borden Co.
New York, N.Y.

*Clinical:*

1st: David Lubin
Crile General Hospital
Cleveland, Ohio

2nd: Ferdinand Harding
Children's Medical Center
Boston 15, Mass.

*Color Transparency:*

1st: Lewis Sunny
Hahnemann Medical College
Philadelphia, Pa.

2nd: Charles Reiner
Highland Hospital of Rochester
Rochester, N.Y.

*Color Print (Joint Award):*

John Beiter FBPA
Robert Wright
Rochester General Hospital
Rochester, N.Y.

*Special Mention:*

Fritz Goro
Life Magazine
New York, N.Y.
(For his photography in the exhibition "Sludged Blood.")

Basil Varian
Philadelphia, Pa.
(For a group of photographs)

*Motion Picture Awards.* Harris Tuttle, who reviewed the entries, reported that scientific films are difficult to evaluate, because of their diversified nature. Nevertheless, the following films were recognized as outstanding and worthy to receive the Association's certificate of merit: (they are listed in the alphabetical order of their contributors)

"The Medical Motion Picture—Its Development and Present Application"—Ralph Creer, FBPA, American Medical Association, Chicago, Ill.

"Time of Human Ovulation"—E. J. Farris, Ph.D., Wistar Institute, Philadelphia, Pa.

"Hummingbirds"—W. Norman Jupe, Los Angeles, Calif.

"Aortic Pulmonary Anastomosis of Congenital Pulmonary Stenosis"—Mervin LaRue, Chicago, Ill.

"A Normal Delivery, Primagravida"—Robert Mallory III, M.D., Rye, N.Y.

"Physiology of Normal Menstruation"—Warren Sturgis, Sturgis-Grant Products, Inc., New York.

The following pictures were accorded Honorable Mention:

"On the Chinese Walking Fish (Channa Asiatica) from Ovum to Adult"—Jay T. Fox, Seaford, L.I., N.Y.

"Necropsy of an Elephant"—Edward M. Gunn, M.D., Army Institute of Pathology, Washington, D.C.

"Marine Life of Woods Hole, Marine Invertibrates"—George C. Lower, Upper Darby Senior High, Upper Darby, Pa.

## MINUTES OF THE BUSINESS MEETING HOUSTON HALL — SEPT 9, 1948

The meeting was called to order at 11:40 A.M. by Dr. Farris. As the minutes of the previous meeting had been published in the Journal, the minutes were accepted as published.

*Treasurer's Report.* Miss Zimmer read a summary of her report for the year Sept. 1, 1947-Aug. 31, 1948, as follows:

| | |
|---|---|
| Receipts | $6460.79 |
| Disbursements | 5355.03 |
| Surplus | 1105.76 |
| Bank Balance (as of Aug. 31, 1948) | 4414.20 |

Dr. Farris reported that the treasurer's books had been audited by Mr. J. Carlile and Dr. J. Garner. The treasurer's report was accepted by unanimous vote.

*President's Progress Report.* Dr. Farris said the past year have brought several new developments. Among them are: the amendment on nominations (to be voted on at this meeting) which he believes solves the problem of giving every member an opportunity to take part in the elections whether or not he can attend the meeting; the introduction of the smoker, and symposia at the annual meeting; the pre-meeting abstracts required of speakers; and the demonstration of clinical photography, for which the Association is much indebted to William Payne. Next year, he said, the members would receive a call for papers well in advance of the meeting. He hoped they would make it their business to respond early, so the programs can be planned and given publicity beforehand.

As to the Journal, numerous suggestions have been made for its further development. Dr. Farris spoke of the work undertaken by Leo Massopust, practically single-handed. He made a plea for more co-

operation in the contribution of original material, and in the submission of the material presented at meetings etc. He also urged the members to give some thought to new features which might be incorporated in the Journal and to send suggestions.

Dr. Farris said that it was with extreme regret that he must announce that Leo Massopust has requested the Association to consider his resignation. Mr. Massopust's departmental duties and research work demand his time; also he feels he has held the Editorship long enough. He will remain as editor until we can find a successor and make other plans.

Dr. Farris said the Board had instructed him to raise funds which would make possible an annual award to be given each year to some one who has made outstanding contributions to biological photography. Sufficient funds had been raised to make the award for several years. It would consist of a jewelled key and a lettered scroll, and would be known as the Annual Award. This year the winner had been chosen by a decisive vote of the Board of Directors. The procedure in the future would be to have the winner chosen by a committee on awards. *(See Annual Award, page 64.)*

*Report of the Editor.* Mr. Massopust spoke of the sacrifices made by the officers of the Association for the good of the membership. He said that in his case he had been much helped by the sympathetic attitude of Marquette University, in allowing him to spend his time and 75 per cent of his secretary's time on Journal affairs. The equipment and the space used for the Journal was the University's.

He reported the total cost of Volume 16 as $3,000.04. In spite of printing difficulties and the rising costs, this sum is within a few dollars of the cost for Vol. 15, last year. The Journal is absorbing 75 per cent of our income. Members must not only make suggestions about the Journal; they must do something about it.

*Messages.* Miss Shiras read a cable from Dr. Peter Hansell of London wishing us a successful meeting, and a telegram from Philip Mott of Kingston, Canada. Messages were also received from Dr. Edward Gunn, Dr. Arthur Proetz, Leonard Julin, Arthur Fuchs, and Stanley McComb.

*Chapter Reports.* Mr. Harding spoke for the Boston Chapter; Mr. Lubin for the Northern Ohio Chapter (formerly the Cleveland Chapter); Mr. Lindsay for Chicago and Miss Gregersen for Los Angeles. All reported a successful year. Dr. Farris said the Association hopes to stimulate more thought along the line of Chapters. We will include a membership list in the Journal to help identify the members in various localities.

*Report of the Motion Picture Committee.* Dr. Richards reported an increase of interest in motion pictures, as evidenced by the International Congresses; by the number of films being shown at scientific meetings; by the new ventures being undertaken in film production; and the number of catalogues being compiled.

He said he had been told we have missed some of our members' films in the lists published in our motion picture report. If so, it was because no information had been sent to us. He asked for the members' cooperation in listing their films.

*Report of the Salon Committee.* Mr. Stevenson reported that in the past year the Travelling Salon had two showings in Chicago (at the Chicago Camera Club, and at the social center of the University of Illinois Medical, Dental and Pharmacy Schools.) It then went to Philip Mott, Queens University, Kingston, Canada. He reported that the prints arrived in good condition and made a fine-looking display. Next the exhibit went to Harry Zifkin, of the Starkman Biological Laboratories in Toronto, and from there to Montreal. The temporary admission allowed the prints to remain in Canada 60 days. It returned from there in very good shape, and was next put on display at the Cleveland Health Museum. Because of the favorable interest it aroused, the museum asked for permission to extend its showing there by an extra week. It was then shipped to Mr. N. J. Kramis, photographer at the Division of Infectious Diseases, Hamilton, Montana. From there it has gone to the Los Angeles Chapter. There has been a request for it in the state of Washington; and two more requests await it when it comes back east.

When it returns to Cleveland after being on a trip Mr. Stevenson checks it, straightens the corners and goes over the mounts with art gum. He said Mr. Mott deserves our thanks for having a wooden packing-case made which was used for the shipment of the prints while in Canada. However, due to certain regulations the prints had to be shipped out of Canada in the same package in which they arrived. Thanks are also due to Miss Pattison, who is in charge of the photography department of the Cleveland Health Museum and is one of our Chapter members. When the people who viewed the exhibit at the Museum complained because the technical data was not on the front of the mounts, Miss Pattison copied the data from the back of each mount and typed it on a small card which she placed under the print.

Dr. Farris thanked the Chairman of the Cleveland Chapter for their activities in behalf of the Salon.

*Report of the Nominating Committee.* The Nominating Committee composed of William Taylor, FBPA, Chairman, Stanley McComb, FBPA, and Warren Sturgis, submitted the following slate:

President.....Dr. Edmond J. Farris
Vice-President.....Dr. Oscar Richards, FBPA
Secretary.....Miss Anne Shiras, FBPA
Treasurer.....Miss Stella Zimmer, FBPA
Directors until 1951....Dr. George Royer, FBPA, Mr. William Stevenson and Mr. Lloyd Varden, FBPA.

*Amendment on Nomination and Elections.* Miss Shiras read the following amendment to Article VI of the Constitution, proposed by the Board of Directors and duly announced to the membership one month in advance of the meeting:

"Nominations shall be made by a nominating committee appointed by the President and approved by a two-thirds vote of the Board of Directors. This committee shall consist of three members, one of whom shall have been an officer or director, and shall present its nominations to the secretary at least two months before the annual meeting at which the election shall be held. The name of any candidate suggested in writing to the secretary by 10 or more members shall appear on the official ballot along with those nominated by the nominating committee. With a majority of its members approving, the Board of Directors shall have the right to add names of candidates to the official ballot. The secretary shall prepare the official ballot and mail a copy to each member at least one month before the election. The vote shall be taken by marking a copy of the official ballot and casting it at the annual meeting or sending it in advance of the annual meeting to the secretary in an envelope bearing the signature of the member voting. The candidate for each office receiving the largest number of votes is elected. According to the number of directors being elected, those receiving the largest number of votes (in order) shall be chosen."

It was moved and seconded that the amendment be accepted as read. After a short discussion the amendment was passed by a large majority.

*In Memory of Basil Varian.* Dr. Farris spoke of Mr. Varian's active membership in the Association, and the fact that he was at work on plans for the Philadelphia meeting at the time of his death last fall. The members bowed their heads for a moment's silence in Mr. Varian's memory.

*The BPA Key.* Dr. Farris reported further on the key which will be given the award winner. If approved by the members this key

could be the official emblem of the Association. The jewelled form could be reserved for awards, but the plain key could be ordered by the members through the secretary's office. He said that the Board had decided that only members who had been in the Association 5 years or more should be eligible to wear the key. The design would be circulated among the members and a vote on it would be taken at the business meeting the following day.

Dr. Richards moved that we accept the plan of the annual award and the money raised for it by Dr. Farris, and that we thank Dr. Farris for putting the matter through. The motion was seconded and passed unanimously.

*Resolutions of Thanks.* The following resolutions were passed unanimously:

"Be it resolved that the Biological Photographic Association hereby expresses its deep appreciation to its Philadelphia hosts, the University of Pennsylvania, and to the University's representatives, for the facilities accorded the Association and for the numerous arrangements made on its behalf."

"Be it resolved that a vote of thanks to the Wistar Institute be recorded in recognition and appreciation of the hospitality extended to the Association."

"Bs it also resolved that a vote of thanks be recorded in appreciation of the excellent work of the local committee in making this meeting outstanding."

"Be it further resolved that these resolutions be printed in the minutes of the Association and that copies be sent to the persons and institutions mentioned."

The meeting adjourned shortly after 12 noon.

## SECOND BUSINESS MEETING

Sept. 10, 1948

The meeting was called to order by President Farris in Houston Hall at 12:15 P.M.

*1949 and 1950 Convention Cities.* The Association had been invited by David Lubin to hold its 1949 meeting in Cleveland; and by Dr. Tibor Benedek to hold its twentieth anniversary meeting in 1950 in Chicago. Each spoke in behalf of his Chapter.

The motions were carried unanimously that both these invitations be accepted.

*Election of Officers.* The secretary was instructed to cast one ballot for the slate as read, by a unanimous vote.

*Adoption of Key as Official Emblem.* A drawing of the design proposed as the Annual Award emblem had been passed among the members. It embodies a camera, a microscope, and the edges are worked to resemble 16 mm. film. There was some discussion as to whether the portrayal of the film was accurate. Dr. Farris said it would be checked again.

The members voted unanimously to adopt the plain key as the official BPA emblem, and the jewelled key as the Annual Award emblem.

*Vote of Thanks to Dr. Farris.* Miss Shiras proposed a vote of thanks to Dr. Farris not only for his work as President but for the additional work he had undertaken in connection with the meeting. It was given unanimously.

The meeting adjourned at 1:45 P.M.

ANNE SHIRAS, *Secretary*

## PSA TRAVELING SHOW

A Traveling Show of forty-two prints has been selected from the Technical Exhibit of the 1948 Exhibition of Photography of the Photographic Society of America which was held in Cincinnati, Ohio, November 3-21.

There are in this exhibit a number of excellent photographs of the tracks of nuclear particles in photographic emulsions prepared by the Kodak Research Laboratories. The Ballistic Research Laboratories of Aberdeen Proving Ground submitted some very startling spark photographs and Schlieren photographs showing shock waves and flow patterns over models of bombs and missiles. There are also a number of autoradiographs, electron micrographs, electron diffraction patterns and color photomicrographs.

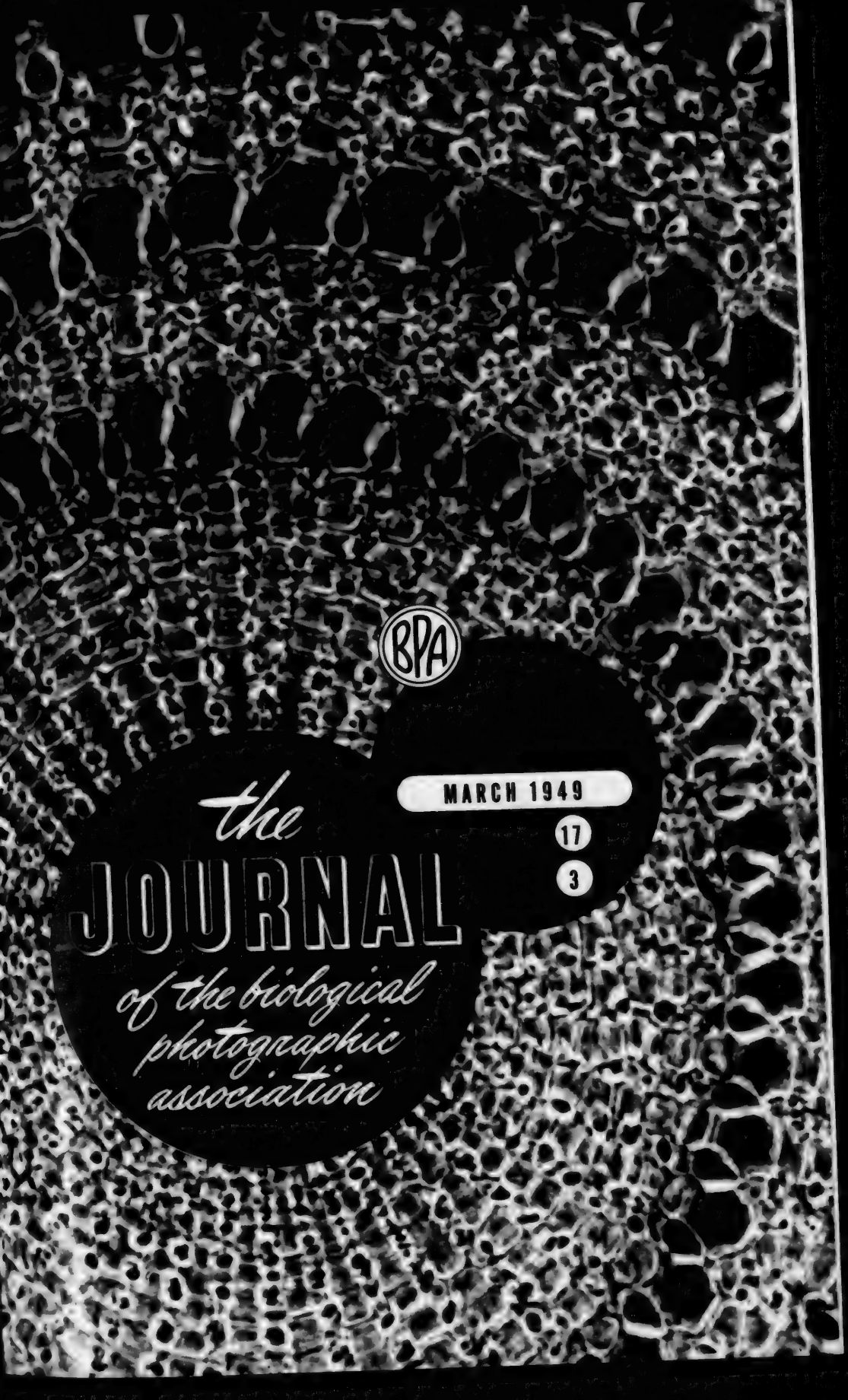
Further information on the availability of this exhibit for showing can be obtained from Mr. E. R. Clark, Chairman Exhibitions Committee, 184 Malden Street, Rochester 13, New York.

### ERRATA—*Volume 17, Number 1, September, 1948*

The illustration appearing on page 16 is Figure 3a.

Figure 3b is *only* the center microscopic picture (without the photomicrograph) on page 17.

On page 29, the two columns of figure 9 are transposed. The left column should be on the right, the right column should be on the left.


BPA
the
JOURNAL
of the biological
photographic
association
MARCH 1949
17
3

# New Journal Schedule

Announcement was made at the September 9, 1948, meeting that Mr. Leo Massopust, editor of the Journal for ten years, wished to resign. The Board of Directors then considered the entire Journal problem.

At the Board of Directors meeting held March 26, 1949, the new editor was selected, his recommendations for the editorial board were considered, and a publication schedule adopted. The new plans regarding the Journal will be submitted to the membership at the 1949 Annual Meeting in Cleveland.

The Journal, beginning in 1950, will appear in four quarterly issues, in February, May, August and November. A volume will begin in February, and end in November, thus avoiding overlap subscriptions from year to year. The Board felt that there should be a summer number, to carry full convention details, and that the appropriate month for this number was August. The Board felt that at the same time steps are to be taken to place the membership on an annual basis, all elected applicants to come in as of the beginning of the year, rather than on the quarterly system of election now in use. All applicants for membership will be officially elected at the Annual Meeting.

Mr. Massopust agreed to remain as editor throughout the publication of the present volume 17. In order to bridge a long gap between the scheduled close of volume 17 in June, and the appearance of the first number of volume 18 under new management, the last three numbers of volume 17 are being delayed until about three months after their scheduled dates. As the covers for all numbers of volume 17 had been printed in advance, the covers carry much earlier dates than the actual date upon which they are to be issued. Thus the number dated December, 1948, actually reached the members in March, 1949. The present number, ostensibly for March, is also about three months behind the printed date. And the number dated June will appear in August and carry full Convention details. It will also include an index for the first 17 volumes, complete. Thereafter, there will be no number of the Journal until February, 1950.

Needless to say, in spite of the change in schedule, each member will receive the number of issues to which his dues entitle him, namely four. After receiving his full quota, he will be invited to renew on the new January annual basis by paying dues pro rata for the remainder of the Volume to be published in 1950.

The new Journal Editor will be announced to the membership at the 1949 Annual Meeting in Cleveland.

# The JOURNAL of the Biological Photographic Association

Volume 17 • MARCH, 1949 • Number 3

Official Publication of the Biological Photographic Association
COPYRIGHT, 1949

## CONTENTS

A Few Fresh Water Micro-Organisms.....Edna Campbell Barker 99

Nineteenth Annual BPA Meeting..... 101

Finding Photographic Information.....Thomas T. Hill 103

The Demonstration of Cellular Elements in the Use of Filters in Photomicrography.....W. V. Cole 115

Continuous Non-Parallax Follow-Focusing and Pan Focusing Cinematographic Techniques.....Tilden W. Roberts 121

An Aid for Close Range Clinical Photographs.....Winnefred Arnold 131

15th Report of the Committee on Motion Pictures, 1948.....Oscar W. Richards 135

Intra-Oral Photography—The Value of Correct Patient-Photographer Relationship.....Harold A. Thomas and John J. Beiter 139

Association News ..... 147

Preliminary Studies of Human Carcinoma with the Polaroic Color Translation Ultraviolet Microscope.....Robert C. Mellors 152

BPA

Leo C. Massopust, Editor

Marquette University School of Medicine

Milwaukee 3, Wisconsin

ASSOCIATE EDITORS

ARTHUR W. PROETZ, M.D., Beaumont Building, St. Louis, Mo.; ANNE SHIRAS, School of Medicine, University of Pittsburgh, Pa.; FERDINAND HARDING, The Children's Hospital, Boston, Mass.; and ARTHUR W. FUCHS, 164 Inglewood Drive, Rochester, N. Y.

Published Quarterly at 561 North 15th Street, Milwaukee 3, Wisconsin. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $5.00 per volume; foreign countries $5.50. Single copies $1.25 in U. S. A.

Copyright, 1949 by Edna Campbell Barker.

# A Few Fresh-Water Micro-Organisms

**Edna Campbell Barker, B.S.***

THE photomicrographs on the opposite page were made with a special micro-reflex camera, used in conjunction with a Bausch & Lomb microscope. The concentrated light source is a General Electric photomicrographic lamp, housed in a box, and the image is projected on a 35 mm. ground glass screen in front of the operator. The subjects are from life and mounted in distilled water on an uncovered depression slide.

In the upper left corner, we see the picture of a young female *Daphnia* awaiting the birth of her first embryo, (original 12X).

At the right, the first three pictures from top to bottom are of another water flea, a *Simocephalus.* (Original 12X) The tree-like organism is a *Hydra.* The body of the *Hydra* is a hollow tube with the inner cells as digestive agents. The tentacles about the mouth are protrusions of the body wall and they capture the food. With the basal end, the *Hydra* may attach itself to the under side of the water film, to a duck weed leaf, or to the glass receptable in which it is kept. The tentacles may stretch out to slender proportions or be blunt in shape. One *Hydra* may give rise to several new organisms by budding. This process is very interesting to watch. They need plenty of live food—Copepoda and small worms, as well as water fleas, are acceptable.

At the left, the second picture from the top is an *Asplanchna,* a rotifer. The body wall is very transparent. Strong, active cilia form the corona and propel the animal through the water. Currents are set up, which draw smaller animals near. These animals may be seized by the jaws, which resemble forceps, and forced within head-first. The indigestible portion of the victim is spewed from the mouth.

A group of Diatoms may be seen in the third picture down on the left. The star-shaped organisms are called Asterionella. The rays are individual cells attached at the center by a sticky secretion. Near

Received for publication February 21, 1949. Copyright, 1949, by Edna Campbell Barker. 3512 Pershing Avenue, San Diego, Calif. Organisms taken originally 12X are enlarged to 18X and those taken at 30X are enlarged 45X.

*Water Biologist, Water Dept. Lab., City of San Diego.

the center of the picture are two filaments suggesting bamboo. These are *Melosira,* and the cells are arranged end-to-end. Another arrangement, suggestive of a fine-tooth comb, shows the cells placed side-by-side. This organism is known as *Synedra pulchella.* Each diatom cell is a single unit capable of reproducing itself by division.

The fourth picture on the right shows a group of green algae, known as *Volvox.* The outer wall of the large colony has ruptured and the daughter colonies have escaped and are rapidly swimming away.

The last picture on the left is a small water flea, called *Chydorus.* It has the same original magnification as the Asplanchna, the Diatoms, and the Volvox, viz.—30X. In common with the other water fleas, it has but one eye. The other dark spot near the eye is a primitive brain. This organism does not swim as actively as the larger water fleas. It is frequently found in rather stagnant water; and, when feeding on an algal filament, may suggest a tight-rope walker.

These pictures show a few of the forms encountered in examinations of fresh-water,—some from reservoirs, others from stagnant pools. As living individuals, each equipped to earn its way and live usefully, they are an interesting study.

---

## INFORMATION ON FELLOWSHIPS

Members may propose for the Fellowship in the Biological Photographic Association other members whom they consider worthy of recognition. Two sponsors are required. Information concerning the procedure and requirements may be obtained from the Secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa.

# Nineteenth Annual BPA Meeting

## The Dates

September 7, 8, 9, and 10.

## The Place

Hotel Cleveland, 20 Public Square, Cleveland, Ohio.

Demonstrations and papers on specific technic.

Symposia, and Discussion of administrative problems (employment, training, budgets).

A Salon of biological photography, with honors for outstanding work. Motion pictures included.

A Technical Exhibit for the display of equipment.

A trip to Nela Park, General Electric Co. and program on light.

A smoker Sept. 7; a banquet Sept. 9, and other social events. Opportunities to get acquainted with your colleagues and exchange ideas. You will have the stimulus of meeting workers in many fields and the satisfaction of hearing your problems discussed.

Committees are at work now, but success cannot depend on committees alone. Your active participation is invited. Begin to plan your Salon entries now. If you have a subject to present or an idea to suggest, let us know about it early. Before long you will receive a Salon entry form and a call for papers in the mail. Take careful note of the deadline on each. In previous years, some of our best material has been offered just before the meeting. These last-minute offerings greatly complicate the work of the committees, who must be able to plan ahead. The Journal to be published in August will bring you the program and schedule of events. This will facilitate your planning and make for a smoother meeting. Please help us to do it.

## The Committees

| | |
|---|---|
| *Convention Chairman* | David Lubin<br>130 Keats Lane<br>Berea, Ohio. |
| *Program Chairman* | Thomas J. Lannon<br>1528 Starkweather Ave.<br>Cleveland 13, Ohio. |
| *National Program Chairman* | Dr. Oscar Richards, FBPA<br>Vice-President, BPA<br>American Optical Co.,<br>Buffalo 15, N.Y. |

| | |
|---|---|
| *Salon Chairman* | William Stevenson<br>Mt. Sinai Hospital<br>1800 East 105th St.<br>Cleveland 6, Ohio. |
| *National Salon Chairman* | Nathan Horton, FBPA<br>Ayerst, McKenna & Harrison<br>P.O. Box 6115,<br>St. Laurent, Montreal<br>Canada. |
| *Technical Exhibit Chairman* | David Lubin<br>130 Keats Lane<br>Berea, Ohio |
| *Publicity Chairman* | David Shields<br>2400 Overlook Rd.<br>Cleveland Heights 6, Ohio. |
| *Equipment & Projection Chairman* | David Shields<br>2400 Overlook Rd.<br>Cleveland Heights 6, Ohio |
| *Registration Committee* | David Lubin and<br>Thomas Lannon |
| *Committee Members* | Miss Pattison, A. Banones,<br>F. Beal, F. Minello and<br>R. Newhouse. |

# Finding Photographic Information

**Thomas T. Hill***

LET us outline the various sources of technical information which you can make part of your own experience with relatively little effort. We should not only talk about the sources of such information; we should talk also of ways of finding that information, and of using it with the least effort.

The first source we think of is the literature put out by the photographic manufacturers, and their service departments, which are always glad to answer questions about the use of their own products (and in some cases, any products).

There have been several good text books on photography written in the last few years, but most of these have been written to teach specific courses in particular schools, and therefore the approach is specialized. (Like myself, you probably have several in your library, which you have not really read.)

The most used sources are technical journals, such as our own "Journal of the Biological Photographic Association." The quickest way to find articles in technical journals is to use the Abstract Journals. The most useful is the quarterly, "Photographic Abstracts", published by the "Scientific and Technical Group" of the Royal Photographic Society, in England. It is relatively inexpensive, approximately $7.50 per year (or $8.00 if you want the copy printed on one side of the page so that the abstracts can be cut apart and mounted on cards). Another useful item is the Monthly Abstract Bulletin of the Kodak Research Laboratories, published primarily for use within the Kodak organization, but offered to outsiders at $3.00 per year. Bound volumes of both Abstracts are available in the reading rooms of many libraries. In these Abstracts, an attempt is made to summarize the article, and if possible to give formulas and other technical information, as well as to give a critical review.

You can of course build up your own library, either personally, or within your department, depending upon the breadth of need and the amount of money available. The use of the Abstract Journals makes it possible to have a pretty good reference library without buying every journal concerned with photography (photographic articles appear in well over 150 journals).

* Received for publication January 10, 1949, from the Photographic Division, Edwal Laboratories, Chicago, Ill.

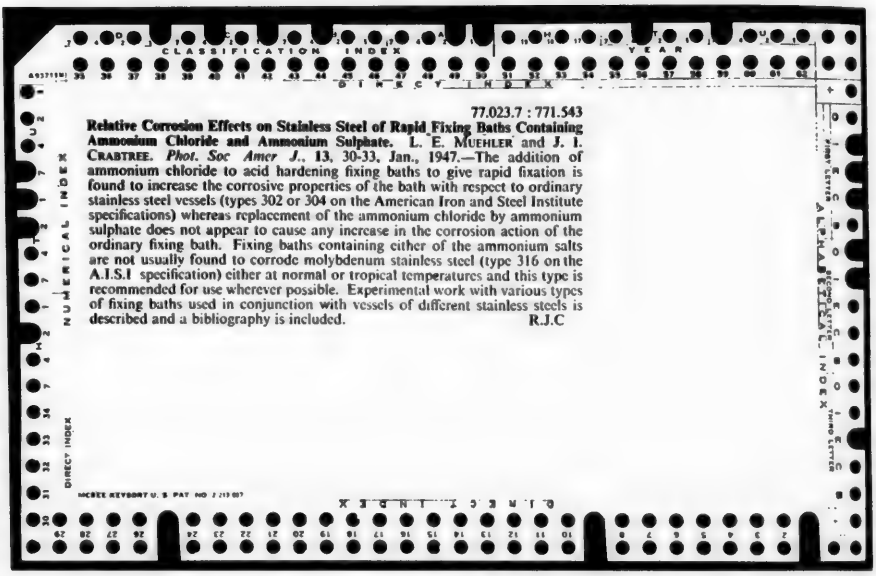

CLASSIFICATION INDEX
YEAR
77.023.7 : 771.543
Relative Corrosion Effects on Stainless Steel of Rapid Fixing Baths Containing Ammonium Chloride and Ammonium Sulphate. L. E. MUEHLER and J. I. CRABTREE. Phot. Soc Amer J., 13, 30-33, Jan., 1947.—The addition of ammonium chloride to acid hardening fixing baths to give rapid fixation is found to increase the corrosive properties of the bath with respect to ordinary stainless steel vessels (types 302 or 304 on the American Iron and Steel Institute specifications) whereas replacement of the ammonium chloride by ammonium sulphate does not appear to cause any increase in the corrosion action of the ordinary fixing bath. Fixing baths containing either of the ammonium salts are not usually found to corrode molybdenum stainless steel (type 316 on the A.I.S.I specification) either at normal or tropical temperatures and this type is recommended for use wherever possible. Experimental work with various types of fixing baths used in conjunction with vessels of different stainless steels is described and a bibliography is included. R.J.C
NUMERICAL INDEX
DIRECT INDEX
SUBJECT INDEX

**Figure 1. Fully prepared punch card. A clipped-out abstract has been glued to the card and the slotting completed according to the several codes.**

The next step would be to build up your own file of information, as has been done for Edwal. Mount or copy onto cards, abstracts, short articles, and references to ideas which you have seen in literature and books. Also, and more important, record notes from your own experience, because even when you are the only one to use the file, it is best not to trust to memory. A systematic method of recording projects, giving the technical data used in solving the problems, can be of inestimable value later on. In some laboratories, only the unusual situations need be recorded. However, for the benefit of new assistants, it is well to make up a couple of dozen cards on the prominent types of photography encountered, even though these will seldom be referred to once a person is familiar with the work. A card file will save time because you will have the data in only *one* place rather than in an assortment of magazines, books, manuals, advertising literature, and so forth.

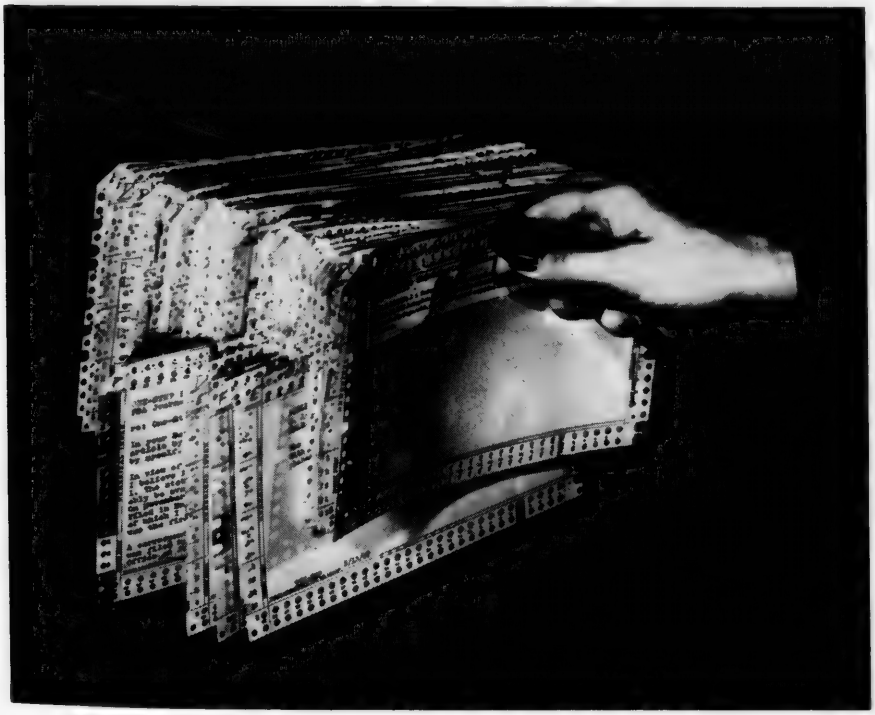
As shown by the illustrations, I am using a particular card, one of two types of punch-cards. The Body-Punched card, such as the IBM or the Remington-Rand types, have narrow slots punched by machine into the body of the card, to signify items of information; this information is coded and sorted by electrical machines. These cards were originally developed by Mr. Powers for the U. S. Census Bureau, and

they are of tremendous use to the Army and other organizations where millions of cards are used. However, they have a disadvantage in that the code is *all* mechanical and you can not look at the card and read it.

The Marginal-punched (or edge-punched) cards, such as I am using, are more useful for smaller files, particularly of 10,000 or less; they have proved very useful in files as small as 50 cards. They are typified by a semi-mechanical punching and sorting technique, and by the fact the major portion of the surface of the card is open for writing, typing or pasting information. Thus the card can bear readable data and you do not have to run it through a machine to learn what is on the card.

These cards, although they require a little more work in preparing, will save tremendous work in *using* the files. In comparison, if more than one card were used in a card file of the old type, for cross-reference use, the edge-punched card will save time and cost, even in the preparation of the file, since all "cross-indexing" is done on a single card.

**Figure 2. The sorting needle is inserted into a given hole in a group of cards and lifted, the cards on which that hole has been clipped drop out, the others stay on the needle.**



The following is taken from a report on the "Central Index of Photographic Data" at Edwal:

## The Problem

Technical data on photographic subjects is available in many forms, in our own files and library, and in journals and volumes not easily available. Abstract Journals exist, to which we subscribe, but they are not indexed by subject.

If effective technical work and articles are to be undertaken, quick and complete literature surveys must be possible, in order to avoid duplication, recognize pertinent data, and completely plan and carry out projects. Title indexes are not enough for such surveys since some of the original article is needed to assess its value, and to permit cross-indexing. Abstracts fill the need, making it necessary to go to the original reference only in a few cases.

Typing or mounting published abstracts, with the addition of original abstracts for data not thus covered, onto index cards partly fills the need, but the problem of cross indexing the cards remains.

The use of punch-cards of the Keysort type makes possible a wide variety of cross-indexing without duplicate cards; it also provides semi-mechanical sorting. The original work of preparing such an index is somewhat more than for other types, but the labor involved in getting information OUT for use is tremendously reduced.

TABLE I

Coding for the Alphabetical Index of the Card Shown in Figure 1

| Letter | Punch | Letter | Punch |
|---|---|---|---|
| A | No Punch | | |
| B | B | | |
| C | C | N | IECB |
| D | CB | O | O |
| E | E | P | OB |
| F | EB | QU | OC |
| G | EC | R | OCB |
| H | ECB | S | OE |
| I | I | (before Sch) | |
| J | IB | S | OEB |
| K | IC | Sch | OEC |
| L | IBC | (after Sch) | OECB |
| M | IE | T | OI |
| (before Mac) | IEB | U | OIB |
| Mac, Mc | | V | OIC |
| M (after Mc) | IEC | W | OICB |
| | | X | OIE |
| | | Y | OIEB |
| | | Z | |

## The Method Chosen

The following description of a filing system using Keysort cards is taken from the article by Cox, Bailey and Casey in Chemical and Engineering News (September 25, 1945):

"In most bibliographic files, the emphasis is on the manner in which the data are to be put into the file. The basis of the system described below is facility in getting desired data out of the file, thus enhancing its utility.

The system is further characterized by simplicity and versatility, for only one card is required for each reference, even though it may be concerned with several subjects. All the references mentioning any one of those subjects may be readily sorted from the file. Classifications other than subject matter may also be used as bases for sorting. For example, classes such as journal articles, United States patents, and the like may be selected.

These results are accomplished by the use of punch cards which have ⅛ inch holes punched along the edges, 1/16 inch from the margin. The authors use the 5- by 8-inch size, shown in Figures 1, 2, and 3. These cards and the necessary inexpensive accessory equipment are manufactured by the McBee Company ("Keysort"), Athens, Ohio, and the Charles R. Hadley Company ("Rocket"), Los Angeles, Calif. Any desired data, such as author, reference, and abstract, can be typed, written, or glued on the card, since the holes occupy but a small amount of space around the margin, leaving approximately 4 x 7 inches free.

**TABLE II**

**General Indexing Plan for Edwal "Central Index of Photographic Data"**

**Author or Worker:** First three letters of name are coded in "Alphabetical Index" section at right. Senior author only is coded if over one; in that case, punch out "plus" hole at bottom, right. If Edwal worker, punch out "plus" in upper right.

**Date:** (of publication of article; issuing of patent; completion of project). In "year area" at top right, but "U" and "T" sections only; if prior to 20th century, punch out blank hole in extreme upper right corner.

**Patents:** Indicated by punching out blank hole in bottom right corner; if a foreign patent, punch also blank hole, bottom left corner.

**Major Cross References:** (such as developers, fixer, etc.) in "Direct Index", bottom of card section only (numbered holes 1-29).

**Complete Classification of subject;** according to the International Decimal System (as used in Photo Abstracts, etc.):
Since this whole file is photographic, the initial "77" of the number is omitted, and remainder coded decimally, in order, around left and top of card, starting with holes numbered 31-34 through Numerical Index, and the "classification index" at top, through the "H" section of the "Year index" (not used for date indexing)

**Experimental Checking:** If data has been verified by laboratory work at the Edwal Laboratories, punch out outer hole of inner vertical pair of holes in the unmarked square in top right corner; if check is unsuccessful, punch out both of that pair (i.e. a deep punch).

Meanings are assigned to individual holes, and on each card at the appropriate holes, the portion of the card between hole and margin is clipped open with a punch, changing the hole to a notch. When the sorting needle, resembling a single-tine ice pick, is inserted into a given hole in a group of cards and lifted, the cards on which that hole has been clipped drop out, and the others stay on the needle (Fig. 2).

Crane and Patterson, in a discussion of the preparation of bibliographies, have said, "As to arrangement, there are at least four possibilities: By date, by authors, by sources, and by subjects." With the proposed system, it is not necessary to choose one of the above categories for the arrangement of the references. One can arrange or segregate the cards according to any of those categories, and include other classes as needed, still using only one card for each reference.

Numerical coding is used to increase the number of items which can be coded on one card. The digits 7-4-2-1 are assigned to four consecutive holes; such a group is called a "field". By clipping one hole, or the proper combination of these holes, any number from one to fourteen, inclusive, may be indicated. Large numbers may be reached by assigning one field to units, another field to tens, another to hundreds, etc.

The advantage of numerical coding is that larger numbers can be used with fewer holes. Disadvantages are that only one number may be coded in a given field on each card, and several passes with the sorting needle are required to sort for a given number. This method must be used for coding data which are mutually exclusive; direct coding is used for data, more than one item of which may be applicable to any one card.

The use of a double row of holes increases the versatility of the card, in that a greater number of items may be coded. No matter whether or not the inner row of holes is used, or when its use may be started, the outer row of holes may be used for coding just as though the second row were not present.

Mistakes may be corrected by the use of "card savers." These are strips of gummed paper punched to conform to the holes in the cards.

## Details on the Edwal System

The one-time expenditure of effort in setting up our own system has been spread over about 18 months of time, since experience with materials and use of the partly-operating system led to improvements and important changes in plan.

We started with a survey of the needs; who would use the information, in what form it would be most useful to those users, what types

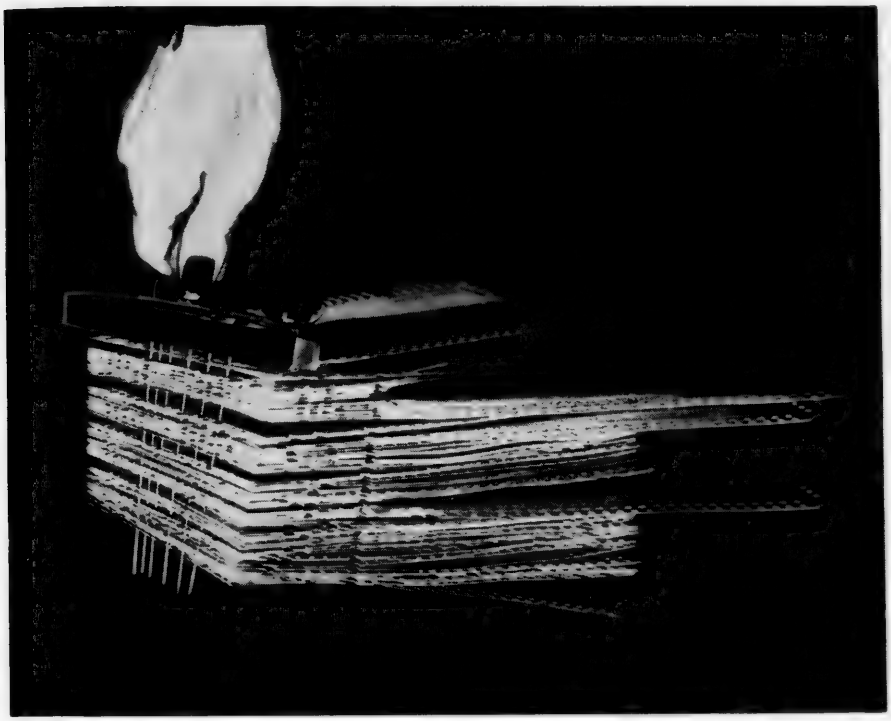


**Figure 3. Sorting with a "selector" or multiple-tine needle. In this case, sorting is to withdraw, from the file, cards bearing abstracts or articles by a particular author, the first three letters of whose name are coded at the right-hand side of the card. In this case the five tines of the hand-made selector have been set to match the code for FLO, the first three letters of the name of L. P. Flory. The simple, home-made multiple-tine selector makes it easier to sort the file for alphabetical codes as it is possible to do it in one "needling" rather than in several.**

of cross-indexing would be most needed, and lastly, the best and easiest ways of putting the information into the file.

Several tentative methods of "coding" the cards were worked out, and revised after a short trial. An effort has been made to use indexing techniques which tie in with widely-accepted techniques. For example, the main coding is numerical, according to the Universal Decimal System, which is used by both Photographic Abstracts and by Kodak Abstracts, as well as many of the journals consulted. The alphabetical coding of author names is according to the revised method of Cox, Bailey and Casey, as shown in Table I.

Two copies of each issue of Kodak Abstracts are received, so that the items desired can be clipped out and glued to the Keysort cards. Photographic Abstracts is obtained in the special printed-on-one-side-of-page form for the same reason. Abstracts to be cut out and mounted

are checked by the person reviewing the literature, and the clerical work of mounting and when necessary, copying the abstracts onto the cards is done by a stenographer. In some cases, a whole short article is put onto the card.

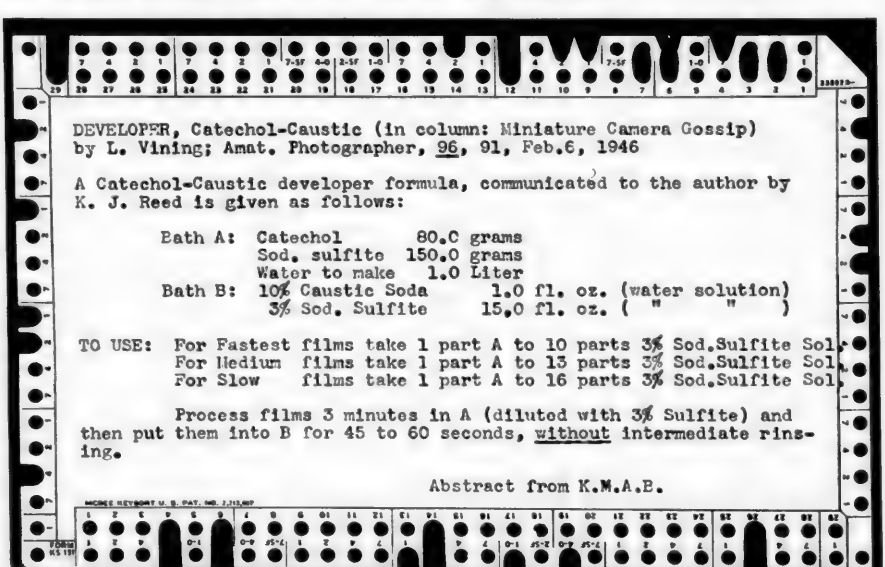
Punching of the cards is done later, in groups, according to the several codes. This is not started until about 2,000 filled-out cards were on hand, in order to be sure that the codes chosen were the best.

For the small number of cards in this file, hand punching is satisfactory; machine punching is of advantage in larger lots, or for such areas as date and author-name in which several holes at a time are punched.

Additional coding in any area can be done later, as for instance with the activation of a new research project which needs cross-indexing of a special idea.

Information desired from this file, which is to be a complete Master Index to all known photographic information, will be for three main purposes: a) to furnish data to answer inquiries from outside the organization, b) to start (and practically complete) a literature search

**Figure 4. Another type of punch card showing three types of slotting with different punches.** The holes in the upper right corner of this card show the use of the middle punch, the shallow punch, and the deep punch. The middle punch is used when the punching is for only the inner of the two rows of holes, the deep punch when the inner and outer are needed, and the shallow punch (or a shallow punching with the deep punch) when only the outer row is needed for coding. At hole No. 6, where the middle punch was first used, and then later the outer hole punched with a shallow punch for and different coding. These do not interfere with each other.


DEVELOPER, Catechol-Caustic (in column: Miniature Camera Gossip)
by L. Vining; Amat. Photographer, 96, 91, Feb.6, 1946

A Catechol-Caustic developer formula, communicated to the author by K. J. Reed is given as follows:

Bath A: Catechol 80.0 grams
Sod. sulfite 150.0 grams
Water to make 1.0 Liter
Bath B: 10% Caustic Soda 1.0 fl. oz. (water solution)
3% Sod. Sulfite 15.0 fl. oz. ( " " )

TO USE: For Fastest films take 1 part A to 10 parts 3% Sod.Sulfite Sol.
For Medium films take 1 part A to 13 parts 3% Sod.Sulfite Sol.
For Slow films take 1 part A to 16 parts 3% Sod.Sulfite Sol.

Process films 3 minutes in A (diluted with 3% Sulfite) and then put them into B for 45 to 60 seconds, without intermediate rinsing.

Abstract from K.M.A.B.

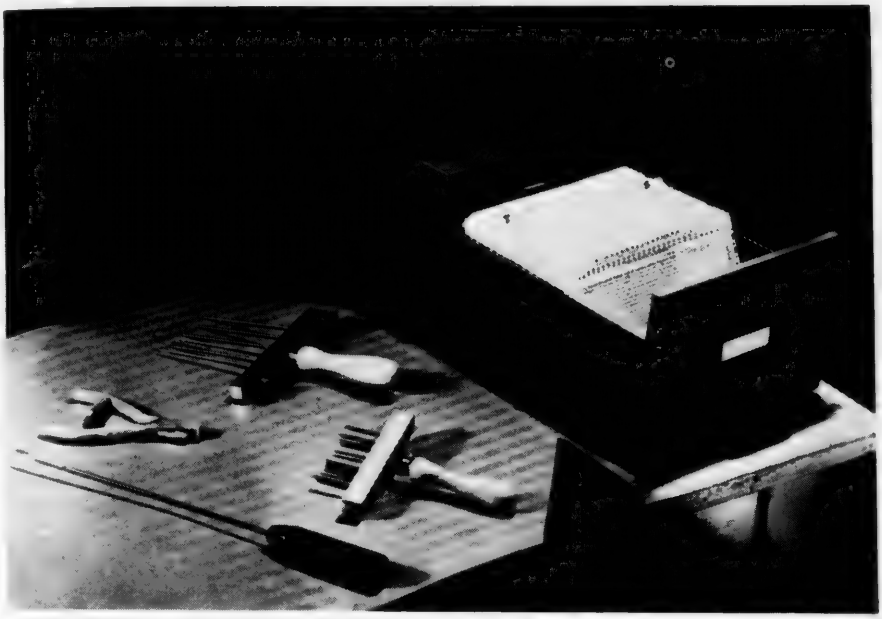


Figure 5. **Equipment for using edge-punched cards.** A file drawer of prepared cards is shown together with a standard single tine needle and deep punch. Also shown are two hand-made multiple-tine selectors; one with the bar of wood (lower) and the other with a bar of ½ inch square brass rod. This shows the simplicity and small quantity of equipment needed.

as a preliminary to writing an article or instruction sheet on a particular photographic subject, and c) to prepare a literature search as a preliminary to planning a research project. In any of these, an obscure reference may be the important one, so that completeness is an aim of the system. In practice, this cannot be attained quickly, so our file has been started with only data directly connected with our work at Edwal, or data which might be the subject of an inquiry directed to us. Bibliographies of other phases of photography (for example, theoretical optics) will have to suffice until need arises for more detailed data (abstracts of individual papers or volumes).

The user of the file will have to gain experience in the choice of the fastest way to use it; at first he will probably search it by using the direct index. The subject desired is looked up on the Direct Index List on a 5 x 8 white file-card at the beginning of the file to determine which holes to needle. A little experience will familiarize one with this and it will be consulted less and less.

Search can be by:

a) Main general subject (in the Direct Index)
b) Specific subject (in the Numerical Index)

c) Author name (in the Alphabetical Index)

d) Date of publication or work (in Year Index)

e) Patents (in two lower corner holes)

Since 2-3 inches of cards is the best size group for needling, 200-300 cards are removed from the file at a time for needling.

Further separations are effected by needling for finer and finer distinctions; for example, in searching for a particular toner formula, the section of cards filed under T is needled for Toners (outer hole number 27) and the cards which fall from the needle are further separated by needling by date if the user recalls about when the formula came out, or by author, or by needling the patent holes if the formula was the subject of a patent. By now the pile of cards is small enough to separate by visual examination.

When the data have been read, copied, or otherwise finished with, the cards are returned to the file drawer.

Now, how can you make use of such a file in your own work?

Suppose for example you have copied out abstracts from the Abstract Journals, or written your own from the articles, to cover the past five years of our Journal of The Biological Photographic Association. This would give about 100-120 abstracts. To this you would add perhaps 100 cards covering individual problems met with in the past year, in your work. When you come up against a new problem, you can solve it the old way by experimenting, or by digging in all the references you have. However, by use of these cards you can very quickly find the information you need by simply "needling" once or twice, which gives you all the information in those articles, and in your own records on the use of, for example, Filters. "Needle" hole No. 8 (The Edwal code for Filters) and you get perhaps 20 cards out of the 250 cards. That has already cut down the amount of work. Now take these 20 cards and "needle" for successively finer distinctions of what you are after. For instance, you may recall that Mr. Flory wrote an article mentioning Filters, or that an article was published in 1944 on that subject. You can therefore "needle" by the author's name, or by the date, and get out a remembered article. But you also want to be sure to get out an article on this subject you may *not* remember, as it may be more important. Another important factor in the use of this type of file is that you can cross-index *every* possible footnote or point in an article. If an article is on Motion Picture Photography of a certain area of the body, and mentioned filters only as a passing comment, you will have it recorded and you will have it indexed on the edge punched holes, and you will be able to find that reference. In many cases, the abstract alone gives you all the information you need. In other cases, you can

refer to the original article either in your own library or in a reference library. When you get down to five or six cards you can separate them by hand and decide which ones you want.

Similar individual subjects which are the important phases of a new problem, such as specular reflection, toning, high-speed photography, lantern-slide preparation, etc. can be separated out from your whole file of general information and quickly made use of.

While completeness of the recording of every phase of your work should be your final aim, such a file is useful even when it is first started because you can read these cards much faster than you can read, or even find, the original articles.

Also in the case of articles, you can make a note, as I do on my cards, whether you tried the method, and whether it works, or does not work, for you. It is a sad fact that many articles (in the popular photographic journals particularly) describe methods which will work only under local conditions which the author forgets to mention. I therefore code whether I have tried the method and whether it works or not. Then, when I look up a subject, I first separate all the cards referring to that subject. Then I separate patents. Then I separate the articles published in journals to which I have access in the Edwal Library, and those in foreign journals which I must look up at a reference library. I then separate each of these into the three groups: 1) tried, 2) tried and worked, and 3) tried and did not work.

There are countless other ways of using such cards. I am presently using them for mounting parts of my stamp collection, and for a bibliography of science fiction stories. There has been a symposium on the subject at each of the last dozen American Chemical Society meetings, and at recent Special Library Association meetings, and some of the experiences related there will be of interest to you.

A speaker from the General Electric Laboratories in Schenectady talked about several files, utilizing punch cards, in active use in the laboratories there. In one case, a chemist took a card file he had previously prepared on the physical properties of a group of chemicals and transfered the data to punch cards. His file, which had consisted of 1500 3x5 cards involving 29 cross-indexes, needed only 50 punch cards. He has since been able to add over 20 additional cross-indexes. Yet all of the information he had previously on the 1500 cards is now available on 50 individual cards. Another file records the full analytical data on each new batch of Silicone resin. The point is that the physical properties brought out by the analytical tests are of importance in evaluating pilot plant lots now in production. These properties are coded and punched on the card and this means that the user can quickly

remove from the file data on previous batches having the same properties as a newly analyzed lot. This file has less than 100 cards in it. The speaker emphasized that these cards are of great use in very small files, and that the files can be made very much smaller (in number of cards) than with the conventional system of making an additional cross-index card for each subject.

Another possibility would be to use these cards as an index to Kodachrome slides of medical subjects. The main problem of indexing slides is to describe each slide so that it will be available to a variety of inquirers. For instance, you may have a slide showing a pathological condition. This could be filed under the description as Dermatitis; it could be filed according to the part of the body covered; it could be filed under the name of any of the pathological conditions of which this type of Dermatitis was a symptom. Different inquirers might ask for it under a great variety of names. Yet the slide itself can be filed normally only under one name. If, however, a punch card index is prepared, every possible descriptive title could be coded and if the inquirer asked for a particular subject, requesting all slides applying to it, a single needling of the file will give the cards for all slides which have any application at all to that subject, no matter what their basic title is in the file of slides itself.

I wish to thank Philip J. Malmstedt for the illustration accompanying this article.

---

## BPA Local Chapter Secretaries

| | |
|---|---|
| Boston | Laurence B. Brown<br>Harvard Dental School<br>188 Longwood Avenue<br>Boston 15, Mass. |
| Chicago | Lorraine Genovese<br>1062 W. Taylor Street<br>Chicago 7, Ill. |
| Cleveland | David Lubin<br>130 Keats Lane<br>Berea, Ohio |
| Los Angeles | Avis Gregersen<br>Department of Dermatology<br>Southern California School of Medicine<br>Los Angeles 33, Calif. |
| New York | Mrs. Margaret S. Frankow<br>Department of Dermatology<br>College of Physicians & Surgeons<br>630 W. 168th St.<br>New York 32, N.Y. |

# The Demonstration of Cellular Elements by the Use of Filters in Photomicroscopy

**W. V. Cole***

IN making photomicrographs it is often desirable to reproduce or to accentuate certain cellular characteristics of microscopic sections. As photomicrography is essentially a timed microprojection on to a light sensitive emulsion, it would seem probable that certain light filters, or combinations of filters which passes light through histological preparations perhaps would produce better detail on the photographic film. This report is an attempt to describe a series of experiments in which different types of microscopy and filters were used to increase contrast and cellular details in photomicrography.

## MATERIALS

Two types of microscopy were employed in this experiment, the first was transmitted light through a microscope fitted with apochromatic lenses, compensating eyepiece, and a variable focus condenser; the second was a microscope fitted with phase contrast accessories[1].

The camera used was a Gamma[2] photomicrographic camera, however, any graflex camera with a ground screen for focusing may be used.

Two types of light source were used, the first was a carbon arc type of illumination supplied from a microprojector (1), and the second was a substage lamp designed for photomicrography[2].

Filters, single and in combination, transmitting the following wave lengths were used, the measurements are recorded in millimicra in all cases .

1. 300 mu. to 400 mu.
2. 360 mu. to 700 mu.
3. 370 mu. to 470 mu.
4. 400 mu. to 600 mu.
5. 460 mu. to 620 mu. (maximum 53% at 535 mu.)
6. 460 mu. to 700 mu.

* Received for publication from Kirksville College of Osteopathy and Surgery, Kirksville, Missouri.

7. 475 mu. to 600 mu.
8. 470 mu. to 700 mu. (maximum 60% at 550 mu.)
9. 500 mu. to 700 mu.
10. 550 mu. to 700 mu.
11. 580 mu. to 700 mu.
12. 600 mu. to 700 mu.
13. 600 mu. through infra red.
14. Polaroid lens.

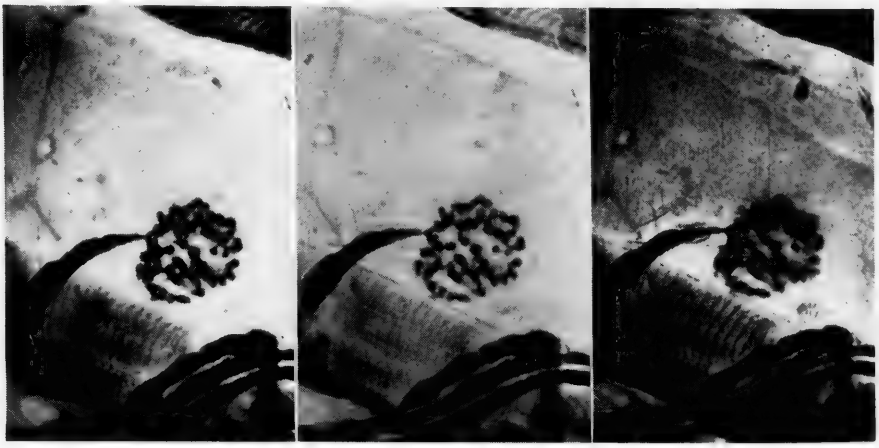
(The callibration of the filters was furnished by the manufacturer.)

The film used in this experiment was high contrast in type and consists of the following: Eastman Kodak contrast process orthochromic,

**Figure 1. Motor end plate, gold chloride stain. x460 enlarged slightly in photographing. Filters UVA-1 (No. 2 in list). Contrast good.**

**Figure 2. Motor end plate, gold chloride stain. x460, enlarged slightly in photographing. Filters—red and yellow (No. 6 and No. 11 in list). Less contrast but more detail.**

**Figure 3. Motor end plate, gold chloride stain. x460 enlarged slightly in photography. Filter blue-green (No. 4 in list). Good contrast, increase in detail.**



contrast process panchromatic and Ansco isopan. In each case the negatives were processed by the recommended solutions for the particular film used.

Paper used to print the negatives was either Eastman Kodak velox F-1 or F-4. The Ansco "printon" was employed as a negative and developed according to directions. In the use of *printon* it was necessary to use the recommended filters with each emulsion, but these were designed to balance the color of the print, not to increase photographic

detail. Three types of histological preparations were used in order to obtain a more comprehensive evaluation of the influence of filters because it is possible that the use of imbedding media, different stains, etc., might influence the recording of cellular details. The preparations used were fixed frozen sections, paraffin sections and teased prepara-

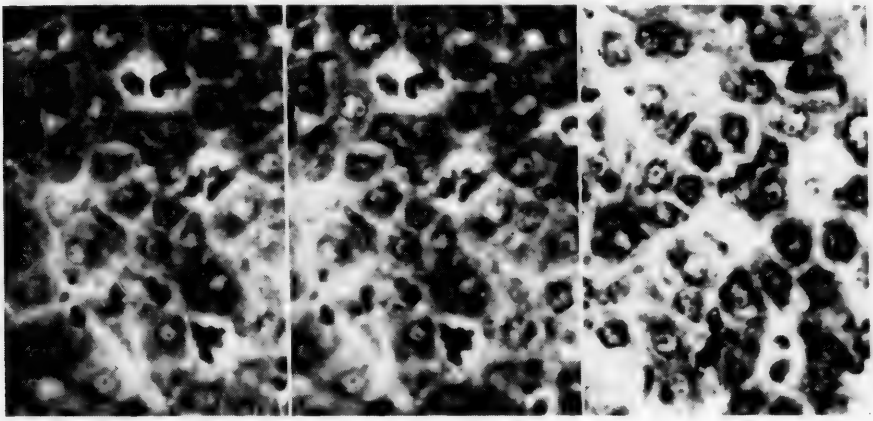


Figure 4. Liver (Rabbit) Gallocyanin and phyloxine stain. x460 Filters blue-green and yellow (No. 4 and No. 5 in list). Good contrast and detail.

Figure 5. Liver (Rabbit) Gallocyanin and phyloxine stain. x460. Filters—red and yellow (No. 6 and No. 11 in list). Slightly more contrast than in figure 4.

Figure 6. Liver (Rabbit). Gallocyanin and phyloxine. x460. Filters UVA-1 and polaroid. Filter No. 2 in list. Increase in contrast but less detail. Nuclear detail is better.

tions. The paraffin and frozen sections were stained with gallocyanin as the nuclear stain and phyloxine as the cytoplasmic stain. The teased preparations were prepared from muscle fibers and stained with gold chloride to demonstrate the motor end plate (2). Unstained sections were prepared by the freezing method and were photographed using the phase contrast accessories. The teased preparations were used as an example of connective and supporting tissues and liver sections as an example of glandular tissue.

## Methods

1. Transmitted light (black and white).

The filters (colored) were inserted between the two portions of the variable focus condenser.

Each set of filters and combination was used to photograph both the muscle and liver preparations. The conditions under which each set of filters was used was maintained at a constant, the only variable being

the exposure time which was increased to compensate for the reduction of light by the filters. The exposure time for producing the best negatives was ascertained by the trial and error method, and the attempt was made to obtain negatives of equal density.

2. Transmitted light (color).

The *printon* paper was used in the same manner as was an ordinary negative. It was noted that the exposure time must be increased in order to obtain adequate exposure.

The filters recommended to maintain proper color of the print were placed between the eyepiece of the microscope and the camera. The experimental filters were used in the same manner as in the previous experiment.

3. The phase contrast microscope.

Due to the arrangement of the condenser it was impossible to place the filters in a similar position as in the previous experiments, instead they were placed between the eyepiece of the microscope and the camera. The polaroid lens when used was placed in front of the light source. The other factors were similar to methods one and two.

## Experimental Results

*1. General.*

The microscope lamp designed for photomicrography was more suitable for this type of work because it eliminated the variation in intensity which was present in the carbon arc type of illumination. Furthermore, when using carbon arc it is difficult to maintain the carbons at an equal distance for periods of time and this variation also produced a variable intensity of light. This, of course, rendered time exposures somewhat inaccurate.

Filters that produced an effect with one type of microscopy produced a similar effect in the other types. This in some cases aided in the demonstration of cellular details in the black and white but was detrimental to color photography.

No appreciable difference was noted in using the various types of negatives. Differences that were observed were compensated for by the use of the proper paper.

It was extremely difficult to compare the results obtained by transmitted light and the phase contrast accessories. However, sections for the same organ were used in some cases and cellular inclusions not observed in stain-sections were revealed by the phase contrast microscope.

*2. Transmitted light (black and white)*

A. Teased preparations.

The best results were obtained, in general, by filters that permitted light waves to pass in the lower wave lengths, that is toward the ultra violet portion of the spectrum. Filters that permitted the passage of a more circumscribed range produced better results than those with a wide range. For example, the filter emitting light between 370 mu. to 470 mu. produced better recorded detail and contrast in the negative than a filter emitting light between 470 mu. and 700 mu. The use of the polaroid filter increases the amount of contrast but apparently does not increase the detail, this accounts for the "pseudo-detail" which had previously been reported (1).

**Figure 7. Liver (Rabbit) Phase contrast microscopy. x430. Filter polaroid. Use of filter increased contrast of the cytological elements.**

Single or combinations of filters producing wave lengths below 575 mu. results in photomicrographs with the best contrast and detail. This is an agreement with previously reported results (3, 4). See Figures 1, 2 and 3.

B. Cut sections.

Results in photographing cut sections were essentially similar to those reported above. See Figures 4, 5 and 6.

*3. Phase contrast photomicrography.*

In general the same filters that improved photographs taken with transmitted light improved photographs taken by this type of microscopy. Filters transmitting light with the lower wave lengths produced the best results.

Since these tissues are unstained, the only contrast between the elements of the tissue observed at the eyepiece is produced by the phase accessories. This, of course, reduced the light at the eyepiece and required an increased exposure time. Due to this reduction in light, some of the filters used in experiment 1 could not be used because light was observed on the ground glass screen and it was not possible to focus the section properly.

Single filters transmitting low wave lengths and the polaroid filter improved the contrast and detail in phase contrast microscopy. See figure 7.

*4. Transmitted light (color).*

A. Teased preparations.

The best results were obtained, as in the previous experiments, by the use of filters that transmitted the lower wave lengths. It was important in the use of *printon* that these filters be colorless, as filters disturbed the critical color balance and the prints would exhibit a predominant color not typical of the section. Such filters, especially the polaroid, did result in a better contrast and, therefore, cellular details were plainer.

Besides the UVA16 (ultraviolet) filter necessary to balance the light for color photography with *printon* it was ascertained that filters transmitting light between 300 mu. and 450 mu., with little color, increased the cellular detail to some extent.

B. Cut sections.

Similar results were obtained photographing cut sections as in the teased preparations.

## Conclusions

Filters with low wave lengths and a polaroid lens, either alone or in combination, improve photographic results in color (*printon*), phase contrast and black and white photography. Apparently this improvement consists of an increase in contrast rather than recording more detail on the emulsion of the negative. The range of effectiveness of filters was ascertained to be between 400 mu. and 575 mu. A steady source of illumination is essential for taking consistent time exposures which are necessary for this type of photography.

## References

1. Cole, W. V. Polarized light in photomicrography. J. Biol. Photogr. Assoc., 16: 146-150, 1948.
2. Cole, W. V. Gallocyanin as a nuclear stain. Stain Tech., 22: 103-106, 1947, and A gold chloride method for motor end plates, Stain Tech., 21: 23-25, 1946.
3. Kovachs, Richard. A manual of physical therapy. Ed. 3, Lea and Febiger, Philadelphia, Pa., pp. 31-36, 1944.
4. Shillaber, C. P. Photomicrography in theory and practice. John Wiley and Son, New York. pp. 177, 1944.

## Notes

1. The phase contrast accessories used in this experiment were obtained from the Bausch and Lomb Optical Co., Rochester, New York.
2. Zonarch microscope lamp was obtained from the Fisch-Schurman Corp., New York, New York.
3. The Gamma photomicrographic camera was obtained from the Gamma Instrument Co., New York, New York.

# Continuous Non-Parallax Follow-Focusing and Pan-Focusing Cinematographic Techniques

**Tilden W. Roberts***

A NEED has always existed for a motion picture camera that would enable photographers to keep moving photo-subjects both focused and framed continuously and identically on film and viewing screen.

In using the apparatus here described, the photographer sees a field lens or ground-glass image correctly orientated from top to bottom and from left to right; the movements of images occur in the same directions as though the photo-subject were observed directly (that is, not in reversed motion as seen when viewing through conventional viewers or microscopes); the viewing screen shows exactly the same image as that projected upon the film whether or not the film is running; and parallax is completely absent at all subject-to-lens distances. The shortest subject-to-lens distance becomes about one and one-half inches with a 2½ inch telephoto lens connected to a track and bellows or extension tube. At such close distances, considerable magnifications are obtained.

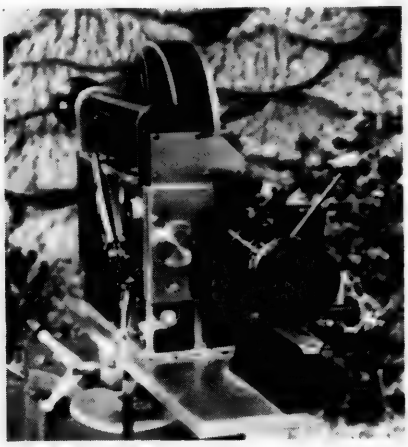
This type of apparatus is especially valuable for photographing objects that will move towards or away from the camera, and it is particularly important for photographing subjects that move in unpredictable directions or in magnitudes that cannot be predetermined.

A constant parallax-free focuser is reasonably of special importance to biologists, and it has particular value for zoölogists interested in making photographic recordings of animals in motion and especially in the photographing of such animals as birds and insects when they are flying or swimming. The apparatus serves conveniently for cinemamicrography.

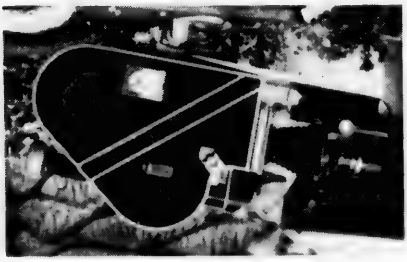
The constant non-parallax focuser should contribute to the production of educational or documentary films and in the filming of amateur and professional cinema plays.

Accomplishments of the constant non-parallax focuser include the saving of film and film costs. In attempting to photograph birds at close range, ornithologists are likely to waste between 60 and 90 per

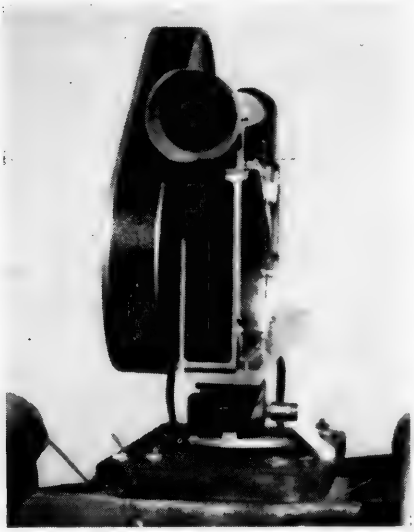
* Asst. Prof. of Zoology, Univ. of So. Calif.
Received for publication February 19, 1949.



(a)



(b)



(c)

**Figure 1. The cine periscopic viewer.**

cent of their film when relying upon conventional methods of focusing and framing. The amount of film saved occurs in direct proportion to speed, extent, and unpredictability of photo-subjects' movement, so a savings in film costs occurs even when subjects characterized by moderate magnitudes of motion are being photographed. Another value of this apparaturs can be stated in terms of improvement in picture quality in regard to proper focus and appropriateness of framing of film subjects. Probably, the greatest value from the constant non-parallax apparatus is that it enables zoölogists to commence photographing specimens which would otherwise quickly leave the scene before they could be focused and framed by conventional methods. This apparatus is useful for making approach and recession shots, i.e., "boom shots" or dolly shots.

## Principles

The reflex mechanism is a beam-splitting glass that remains permanently fixed in its proper position. Its front surface possesses a coating of a substance that increases the reection of light to about 10 per cent of the total light which enters the lens, and its rear surface bears a coating of a substance that reduces its light-reflectivity to a minimum.[2] The film receives the balance of illumination (about 90%). This reflectivity-transmission ratio of about one to nine is suitable for color photography.

[2] coated by Bob Frazer of Acra Instruments of Los Angeles. Acra has since become incorporated with Pacific Universal Products Corporation of Pasadena, California.

When using film with a speed index of 100 in bright daylight, the split-beam reflection-transmission ratio would need to be between one to three and one to one. That is, between one third and one half of the total amount of light that enters the lens would be required for the viewer. Otherwise the viewer images would be too weak because of the reduction in size of diaphragm openings that accompanies use of high speed films.

High reflectivity reflex glasses, pellicles, or prisms would not commonly be suitable for outdoor color photography because good film illumination is important for appropriate color exposures and it is disadvantageous to lose much illumination (that could be effective upon film) by reflecting it to a viewing glass. When the lens diaphragm is quite well open as it is for color film speeds, the making of *f* stop corrections to compensate for loss of light through a viewer involves increasing the sizes of diaphragm apertures unless the proportion of illumination lost through the viewer is slight. When such compensations are considerable in extent, losses in depth of field and picture definition tend to cause poor quality pictures.

At the present time, the ground-glass in my camera is being replaced with a plain curved-surface field lens marked only with cross lines. This will provide "aerial images" much brighter and clearer than are possible with ground-glass viewing screens. A similar system is provided in Maurer cameras except that with "rackover" cameras, focusing can not be continued while the film is in motion.

The Ciné Special camera can be adapted with a plastic reflex pellicle. Pellicles are about one thousandth of an inch in thickness, whereas, the thinnest glass plates are three thousandths of an inch in thickness (*2). Pellicles must be supported by a rigid framework material about one-sixteenth of an inch in width. Some uncoated pellicles offer 91 per cent light transmission to nine per cent light reflection (*1). Other pellicles offer as much as about sixteen to one transmission-reflection ratios (*3). Their transmission-reflection ratios can be altered by coating treatments. Pellicles are manufactured by Photographic Products, Inc., of Los Angeles. The Ransom Physics Laboratories (of L.A.) have also made pellicles on special order. These companies and Oliver Engineering Co. are among those who have mounted pellicles on frameworks. The Oliver and Ransom companies have indicated their willingness to adapt Ciné Special cameras with pellicles.

It is possible to adapt the Ciné Special Camera with a beam-splitting prism instead of inserting a plate or pellicle. However, a prism adaptation has certain disadvantages, one being greater expense. It is apparently the least desirable of the possible reflex adaptations for 16 mm. cameras. When prisms are inserted, lenses must be situated farther away from the film than the standard distances. For some lenses, this

might be accomplished by the employment of bellows or special lens mountings. Paul Roos of Oliver Engineering Co. has suggested the advisability of inserting a lens turret supporting plate so as to project the turret to the proper distance for all lenses. This extension shift would amount to about one-third of the thickness of the inserted prism. The reason for the lens shifting is based upon an optical principle and is not due to the fact that physical space barely exists for the reception of a prism. The insertion of prisms into the optical system of 16 mm. cameras would tend to cause chromatic abberations and poor definition of images, though these results would be more theoretical than actual except for lenses having relatively short focal lengths. The shorter the focal length of the lens, the worse the abberations would tend to be. The conclusions obtained were: that the prism system for 16 mm. cameras would not be very satisfactory for wide angle lenses, that this system would probably be barely or often passable for the standard 25 mm. lens, and that the prism system would be completely satisfactory for use with telephoto lenses (*4). Abberations could be eliminated by having the beam-splitting prism situated in front of the camera lenses (*2,4). Probably, the viewer images could be picked up in this manner from within a lens shade. This might require that the whole viewer be mounted on a sliding rack, at least if bellows were to be employed.

The viewer is a removable periscope that can be used on Ciné Special cameras of any model to date with either 100 or 200 ft. magazines. It shows the photo-subject image at the rear of the camera while the photographer looks forward. The viewer can be equipped with appropriate magnification including variable magnification powers for extra-critical focusing.

## Techniques

Efficiency in follow-focusing and pan-focusing requires practice. The extent of skill attainable depends in part upon an acquired ability for judging distances of manual movements along with good vision. Follow-focusing is most easily accomplished by turning a wheel placed at the side of the lens so as to move the lens mount on a geared track. The track mount rests upon the projection of a camera supporting platform. A less efficient alternative is the employment of a focusing handle that is attached to the focusing ring of each lens. Such handles can be aligned with f stop and distance designations marked on a transparent plastic plate that is slipped over the lens mount. This type of plate is likely to be useful only in the initial picking up of images in the viewer and obviously involves the use of both eyes.

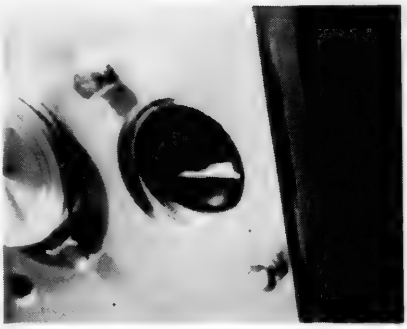


Figure 2. View of the reflex glass.

Figure 3. Camera on shoulder rack.

Trial and error focusing movements should be limited to the initial picking up of images in the viewer. When images are in focus, trial and error lens shiftings will usually cause over- and under shootings. Therefore, the photographer must be able to recognize (through practice) instantly and constantly when images are in "perfect" focus, and the universal desire and tendency to try to improve the sharpness of images at all times must be continuously inhibited. The operator must instantly recognize the extent to which photo-subjects are approaching or receding, realize instantly which way to move the focusing adjustment according to the direction the photo-subject is taking and also, through practice, develop a natural tendency to move the focusing adjustment appropriate amounts of distance depending upon the extent that the photo-subject approaches or recedes per unit of time. An assistant may be required to keep the operator informed as to the directions and extents of movements of animals that are on plain backgrounds such as air or water. Brief codes can be developed for this.

Best results are obtainable when the camera is mounted upon a tripod or shoulder rack. A small wagon can serve as a dolly to carry both camera and self-propelled photographer. A dolly track should be used unless a very smooth floor is available.

The photographer can keep track of a rapidly moving object—when its image may shift from the viewing glass—merely by occasionally opening whichever eye is not held to the viewer.

In looking through the viewer, the photographer serves as an ocular shield so as to prevent entrance of light through the permicroscope to the film. The photographer needs to keep the ocular cup close to his face also to prevent sky light from weakening and obscuring the images.

The reflex does not limit types of lenses that can be used. The lens turret can be used unless track and bellows are employed for mounting the lens. Four-lens turrets can be used (Oliver Engineering Co., Los Angeles; Hart, San Francisco).

When photographing in shadeless places during sunny weather from about 10:00 A.M. to 3:00 P.M., it has been necessary to keep the viewing eye dark-adapted by wearing dark glasses. The glasses are raised over the forehead just before looking through the viewer. When the ground glass screen is replaced with clear glass, it is expected that this trouble will be eliminated.

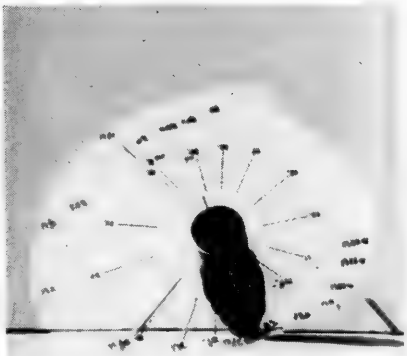


Figure 4. Plastic plate which shows markings that represent f stops and distances.

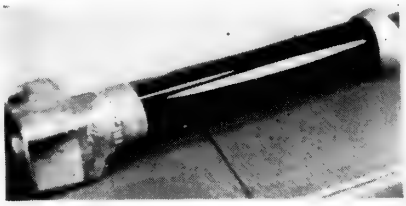


Figure 5. A periscopic viewer ("made" by the author). The prism case was adapted from a food can and plastic wood, the lens tube from cardboard, tapes, and plastics. This viewer was held onto the camera by rubber bands. When attempted by an amateur, aligning of prisms and lenses involves many hours of effort. Paul Roos took care of the lens requirements and provided directions for their placement sequence.

## Limitations

(1) Loss of illumination. The film receives about 90 per cent of the illumination that enters the lens. Therefore, proper *f* stop correction for loss of light through the viewer can be made for uncoated lenses by setting a light meter at 90 per cent of the light intensity designation. (Corrections are unnecessary when coated lenses are employed). Such a procedure is accompanied by a corresponding loss in depth of field although such loss is usually negligible. In artificial illumination loss in depth of focus can ordinarily be prevented by increasing the intensity of illumination beyond what would otherwise be employed. All of my insect and bird photography has given more than adequate depth of focus with appropriate exposures on color film for both natural and artificial illumination.

(2) Humidity and condensation of moisture on the ocular. In very

hot weather or very humid atmospheric conditions, it is sometimes necessary to have a light-weight photographers' hood over the head and shoulders so as to include the rear of the periscope. This procedure permits the operator to stay at least a half inch from the ocular cup. Ocular ventilation solves the problem because condensation moisture comes mainly from perspiration and eye moisture. When the hood is used, condensation of moisture on the ocular lens does not occur, light does not enter the perimicroscope to the film, and skylight reflections from the ocular lens are prevented. Another method (*4) of ocular cup ventilation is to have several ventral holes punched in the ocular cup. Still an additional method of moisture clearing would be to employ a rotatable transparent plastic disc nearly twice the area of the ocular field and half projecting through a slit in the ocular cup.

(3) The glass plate reflex is an additional item that must be kept clean. It must be kept as clean as a lens, and it can not be pressed with any firmness.

(4) Double images. When reflex plates are employed for which 75 per cent or less of illumination goes to the film and about 25 per cent or more to the viewer, double imagery is not apparent. However, when the proportion of light reflection-transmission is about one to nine, secondary images appear about two degrees below primary images. Secondary images are about one-tenth as brilliant as primary images. Secondary images are not conspicuous and have not interfered with critical focusing nor hindered quick focusing. Secondary images are apparent only to the extent that linear objects (e.g., twigs) or bottom edges of objects tend to be horizontal. Vertical linear objects, vertical edges of objects, and horizontal top edges of objects are seen as single entities.

(5) The speeds of B & W film used must be as close as possible to color film speeds for which the reflex device has been adapted by appropriate coatings.

(6) Lenses must be shifted to new positions in certain lens mounts in order to make focusing to considerable distances possible when the reflex device consists of glass.

(7) Plastic reflex pellicles which are so thin that they do not produce double images require mounting in a supporting framework, and there is scarcely sufficient room for such a mounting in 16 mm. cameras unless the mounting projects so as to make the turret useless. (*4)

(8) The wearing of glasses by the operator does not make focusing through the periscope viewer unfeasible.

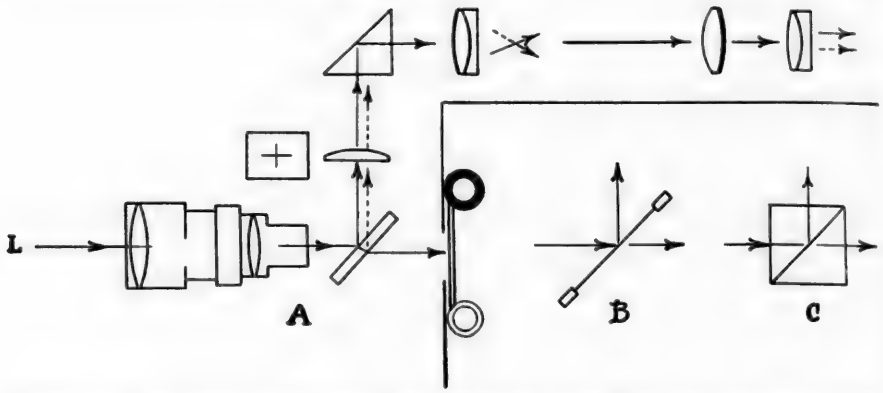



Figure 6. An optical system for a ciné periscopic viewer; and three types of beam-splitters (side views). A. Diagram of glass plate beam-splitter with optical system. B. pellicle. C. double prism. L represents path of a central beam of light.

## History of Beam-Splitting Devices

The present author has instigated an adaptation of the split-beam principle to 16 mm. cinemacrography by developing techniques through tests and by employing an optical engineer to adapt a Cine Special Camera with a reflex device coupled with an appropriate finder-viewer.[3]

Split-beam prisms have been in use for a long time in photomicrographic and demonstration oculars for microscopes. See Tuttle, 1927. One type of optical arrangement is pictured in the Eastman Kodak Company's "Photomicrography," 1944, Figure 17, page 116.

The general principle of the reflex plate is described on page 118 of the same book mentioned above. Three types of beam splitters are shown in Figure 6. There are many types of beam-splitters. Most of these types are pictured by Wall.

Art Reeves of Los Angeles holds the patent which he obtained several years ago on plate and pellicle camera beam-splitters coupled with an appropriate type of view finder (Patent No. 2,417,125). After undertaking research, he developed this device and speeded its completion especially for the U. S. government armed services. His 35 mm. reflex camera is not as yet in large scale production and the 16 mm. camera which Art Reeves has designed will not be on the market for at least another year. (*3)

Permission needs to be obtained from patent owners before their patented devices can be manufactured or assembled as an adaptation to some already manufactured product. (*3) On the other hand, patent

[3] Designed by Mr. Paul Roos, Chief Optical Engineer, Oliver Engineering Company, 6537 Santa Monica Blvd., Los Angeles. Available for demonstration by the author in the Los Angeles area.

owners have no claim over pictures photographed with cameras which incorporate adaptations of their patented equipment.

It would be at least difficult and apparently impossible to find or invent a type of beam splitter (suitable for motion picture cameras) that would not be covered by patents. (*3)

The Cineflex (offered by Cameraflex) and Arriflex (German) cameras are equipped for parallax-free continuous focusing through the taking lens. They are 35 mm. cameras and have been advertised in American Cinematographer, etc. These cameras incorporate shutter reflectors instead of making use of beam splitters.

Summary: Evidently, there are but three makes of cameras being manufactured that provide parallax-free continuous focusing (through the taking lens). The size of film for these cameras is limited to 35 mm. None of these cameras are numerous. Arriflex cracked shutters have been difficult to replace; (Hollywood Camera Exchange recently obtained a replacement from Germany). Availability of Art Reeves Cameras has been and still is very restricted or/and limited in numbers. Art Reeves is the only motion picture camera manufacturer who incorporates the split-beam principle for continuous focusing.

## Costs

Speaking for zoölogists, the saving in film should pay for the cost of adapting a camera with a reflex pellicle. The conventional waste per 1200 feet of color film in photographing animals at close range should cover the price of such an adaptation. One might estimate that conventional waste per forty-five 100 ft. rolls of color film in close-up biological photography should cover the cost of a periscopic viewer.

## Principal Aims

Visual aids are as important as any other factor in the teaching of biological sciences. The present paper is written with the hope and expectation that the equipment described will make possible the filming of valuable educational material which would otherwise remain in the realm of impossible or impractical and unaccomplished projects; and it will be possible for zoölogists to capture an unlimited number of shots that would otherwise never be obtained. Results with this type of equipment thus far prove that such expectations are already being realized.

## References

Reeves, A. 1945. The Art Reeves Reflex Motion Picture Camera, J. of the Soc. of Motion Picture Engineers. 44(6): 436.

Tuttle, C. 1927. Motion Photomicrography with the Ciné Kodak, Trans. of the Soc. of Motion Picture Engineers. 11: 213 (August).

Wall, E. J. 1925. The History of Three-color Photography. American Photogr. Publ. Co., Boston. 747 pp.

* Personal Communication:

1. James Beatty, Photographic Products, Inc., Los Angeles.
2. John H. Ransom, Ransom Physics Laboratories, Los Angeles.
3. Art Reeves, Art Reeves Motion Picture Equipment, Los Angeles.
4. Paul Roos, Chief Optical Engineer, Oliver Engineering Co., Los Angeles.

# BPA Officers and Committee Chairmen

| | |
|---|---|
| President | Edmond J. Farris, Ph.D.<br>The Wistar Institute<br>Philadelphia 4, Pa. |
| Vice President | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Secretary | Anne Shiras<br>University Office<br>Magee Hospital<br>Pittsburgh 13, Pa. |
| Treasurer | Stella Zimmer<br>Photographic Department<br>School of Medicine<br>Syracuse University<br>Syracuse 10, N.Y. |

---

| | |
|---|---|
| Editor of Journal | Leo Massopust<br>Marquette University<br>Milwaukee 3, Wis. |
| Motion Picture Committee | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Committee on Sustaining Memberships | C. Graham Eddy |
| Committee on Grants | Veterans Administration<br>Washington 25, D.C. |
| Annual Salon | Nathan S. Horton<br>P. O. Box 6115<br>St. Laurent<br>Montreal 3, Canada |
| Committee on Fellowships | Ferdinand R. Harding<br>Children's Medical Center<br>Boston 15, Mass. |
| Committee on Local Chapters | Avis Gregersen<br>Department of Dermatology<br>U. of So. Calif. Med. School<br>Los Angeles 33, Calif. |
| Committee on Awards | Leo C. Massopust<br>Marquette University<br>Milwaukee 3, Wis. |
| Traveling Salon | William Stevenson<br>Mt. Sinai Hospital<br>Cleveland, Ohio |

# An Aid for Close Range Clinical Photographs

**Winnifred Arnold***

CLINICAL photography at close range demands an intense illumination which will permit satisfactory exposures. The usual equipment of photofloods or spotlights presents disadvantages, especially when using color film or taking cavity pictures. The light frequently does not permit the use of small diaphragm stops which results in loss of depth of focus. It is difficult to eliminate undesirable shadows. Photofloods placed close to the subject present the problem of excessive heat. The actual approach to the patient may be hampered by equipment such as the examining chair or operating table. To obviate these difficulties, the instrument herewith presented has been designed and found to meet the requirements of a clinical photographer in a most satisfactory manner. The construction is for a Leica camera with a sliding focus, however, this can be altered to suit other equipment.

The three photographs illustrate the general design of the instrument which consists essentially of an extension arm and lighting unit. The arm, which screws on the tripod, has an adjustable post at one end and a counterbalance at the other. The lighting unit is a triangular base with two reflectors for number 1 photofloods. Mounted between these are the camera and a small spotlight for focusing. The flood lights are controlled by a footswitch.

In actual use, the tripod is placed in position, minor horizontal and vertical adjustments are made by shifting the arm, the post or tilting the whole unit on the pan head. The arm permits the proper placement of the camera and lights for close range photographs. The small spotlight is used to focus the camera after which the photofloods are turned on only for the brief moment that the exposure is made. Thus is avoided the discomfort of the patient produced by the heat of the bulbs. Having the light source located on the camera plane eliminates shadows and increases the strength of illumination. At a range of seven inches, the average exposure is f 12.5 at 1/30th of a second on Kodachrome. This gives good depth of field and avoids blurring from slight move-

*Received for publication November 29, 1948. Medical Photographer, University of Michigan Dental School.

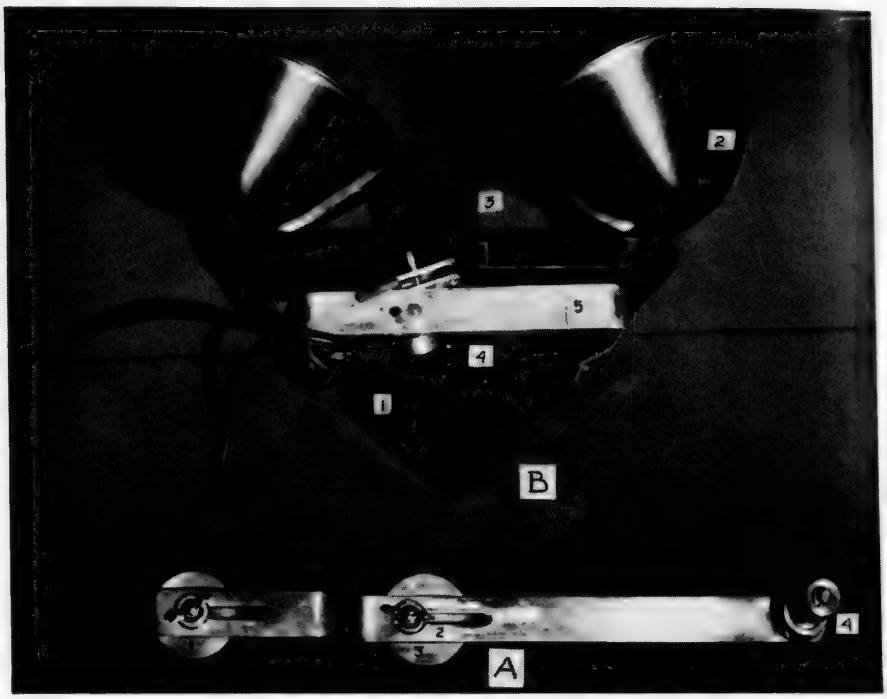



Figure 1.

A. Extension Arm. 1. Counterbalance. 2. 2" slot for horizontal shift. 3. Disk which fastens to tripod. 4. 4" post for light unit. Adjustable.
B. Light Unit. 1. Triangular base 8" x 8" x 11". 2. 6" reflectors 8" apart. 3. Spotlight for focusing. 4. Threaded hole for tripod or extension arm. Base for camera, 2½" high.

ment. During an operative procedure in which a series of pictures is being taken, the extension arm can be swung out of the field without moving the tripod.

## Summary

There has been presented a simple, inexpensive device which meets the main requirements for clinical photography.

1. The direct, intense illumination allows the use of small diaphragm stops, thus giving good depth of field.
2. There are no objectionable shadows due to the positioning of the lights.
3. Close range photographs can be taken without prolonged use of photofloods.

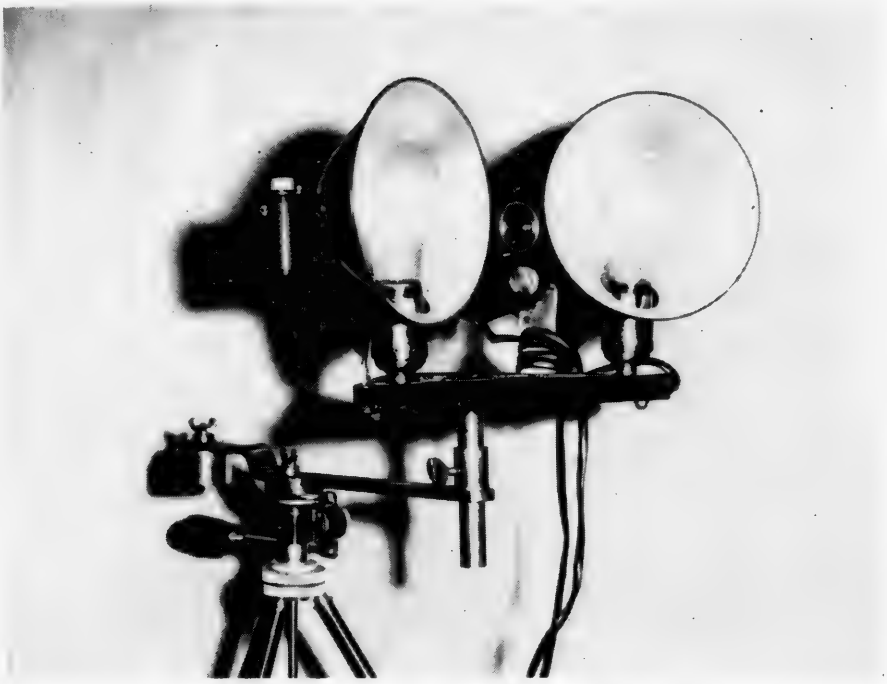
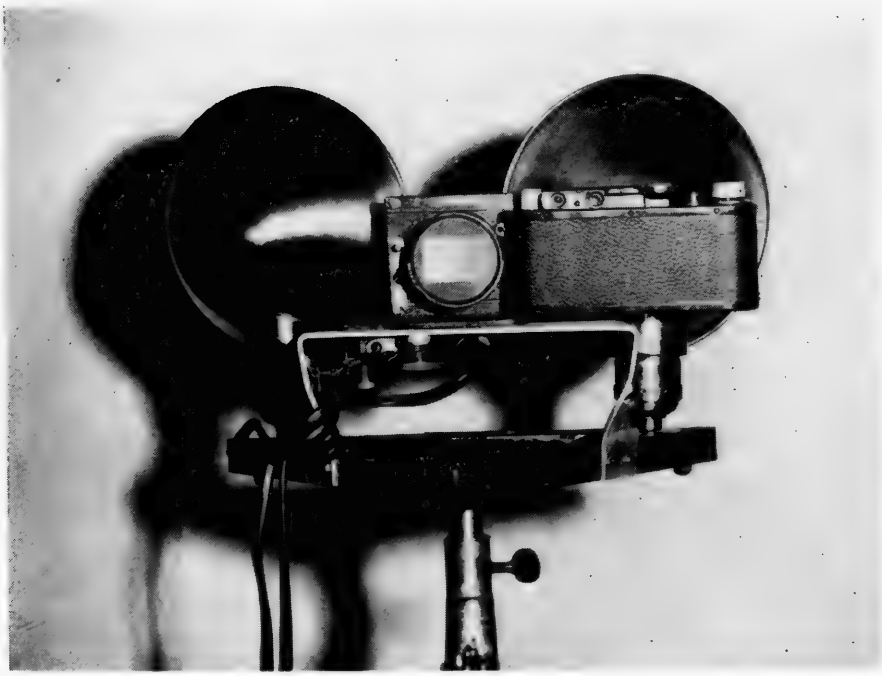


Figure 2. Front view of assembled unit.



Fgiure 3. Rear view of assembled unit.

4. It is a lightweight portable unit, complete in itself.
5. The extension arm facilitates a close approach to the subject.
6. Positioning of the camera and lights is accomplished quickly and easily.
7. The unit is adaptable to photography of specimens, models or printed material where flat lighting is desired.

The instrument presented overcomes many disadvantages of other techniques.

---

## Royal Photographic Society of Great Britain

94TH ANNUAL EXHIBITION, 1949

A comprehensive exhibit, including all types of photography will be held in London, September 8 to October 26. During November it will be shown in Southport and Lancashire. The sections are as follows:

I. Pictorial Photography in Monochrome
II. Pictorial Photography in Color
III. Scientific Photography
IV. Nature Photography
V. Stereoscopic Photography
VI. Record Photography
VII. Kinematography

The selecting Committees will make no distinction between members and non-members of the Society, or between amateurs and professionals. Medals will be at the disposal of the judges in all sections except I and II. The Rodman Medal is also available for award in Section III, with special reference to photomicrography and/or radiography, and the Hood Medal for meritorious performance in any branch of practical photography. A catalogue of the exhibition will be supplied to every exhibitor.

BPA members may secure entry blanks with full particulars on the first six sections from the BPA Secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa. Copies of a form giving details of the Kinematograph Section must be obtained from the Secretary, The Royal Photographic Society, Princes Gate, London S.W. 7. The closing date for entries is July 23, 1949.

## *15th Report of the Committee on Motion Pictures, 1948*

### I. FILMS REPORTED BY OUR MEMBERS.

Harold C. Baitz: The time of human ovulation, 458′ C.

Dr. Ralph Buchsbaum: Effect of radiations on living cells, 800′ B.

Ruth Cordish: Rhinaplasty, 800′ CSi. (Not available).

Murl Deusing: Butterfly botanists (Coronet Instr. Films); Snakes are interesting (Associated Film Artists).

S. C. Dunton: Baby from Borneo, 517′ CSi; Strangers from afar, 712′ CSi. Inf: Education Dept., N. Y. Zoological Park, Bronx 60, N.Y.

Wynne S. Eastman: Left-side approach for small bowel obstruction, 630′ CSi; Nephropexy of new modification of Deming's technique, 740′ CSi; Hemorrhoidectomy, 285′ CSi. Inf: 1705 Crawford St., Houston 3, Texas.

Jay T. Fox: Life history of *Channa asiatica* (Chinese walking fish) 300′ CSi.

Myrtle S. Frankow: Anastomosis of the vas deferens using tantalum gauze splint, 400′ CSi. Inf: 630 W. 168th St., New York 32, N.Y.

Leo Goodman: Abdomino-perineal resection of the rectum, 900′ CSi; Pericardiostomy for suppurative pericarditis, 400′ CSi; Torak undecended testicle, 400′ CSi; Multiple apicoectomy, 800′ CSi; Local anaesthesia and minor oral surgery, 1000′ CSi.

Allen Hancock: Baby Care, (Rooming-in-technic) 450′ C.

Dr. Edward C. Hughes: Mechanism of labor. (No data furnished).

Dr. H. G. Kobrack: The function of the ear in health and disease, 1300′ CSo. Inf: Available later through Medical Film Guild.

Thomas J. Lannon: The anatomy of leg and foot, 2000′ CSi. Inf: Cleveland Clinic Foundation, Cleveland, Ohio.

Dr. Donald W. Leonard: Subperitoneal cholecystectomy, 350′ B.

Henry M. Lester: On time and light, 800′ CSi.

Dr. Hunter J. MacKay: Herniated intervetrebral disc, 350′; Supra-diaphragmatic sympathectomy, 300′; Traumatic subdural hygroma, 200′; Elector-encephalography, 350′; "Ready made" method of canioplasty, 800′. All CSi. Inf: 4757—47th N.S., Seattle 5, Wash.

Glenn E. Mills: Treatment of polio 1600′ C; Physical therapy of polio patients, 1200′ C.

Homer Montague: Squint and cataract surgery, 1800′ C. (Not available).

Phillip H. Mott: Clinical studies in medicine: Oculogryic crisis of Parkinson's disease, Disseminated sclerosis (2), Myasthenia gravis and hysteria, Poliomyelitis, Froelich's syndrome, Obesity—pituitary type, Amyothropic lateral sclerosis, Same—bulbar type, Senile tremor, Hepatolenticular degeneration. Clinical studies in surgery: Charcot's joint, Supraspinatus tendinitis, Arthrodesis, Morgious disease, Hypermobile flat feet. Urology-Surgery: Urethral calculus, 150′; One stage uretehosigmoidostomy with cystectomy, 300′. All CSi. Inf: Audio-Visual Studio, Faculty of Medicine, Queen's U., Kingston, Ontario, Canada.

F. M. Nielson: Prefrontal lobotomy under direct vision, 2100′ CSo. Available to med. profession, 2 Lake Ave., Nassau, N.Y.

Wm. Harold Oliver, Jr.: Embryonic development (Sea-star *Pateria,* fert. through bipinaria) 1 reel B&CSi.

Edwin S. Powell: Spinal fusion, CSi. Inf: Dr. A. T. Moore, 1528 Gervais St., Columbia, S.C.

Clyde A. Prusman: The simple cell, 400′ CSo; Life in a drop of water, 400′ CSo. Inf: Coronet Instructional Films, 24 E. South Water St., Chicago 1, Ill.

Dr. Irving Rehman: X-ray motion picture studies of the thorax, BSi.

Paul Showstack: Arthoplasty, for correction of ankylosis, 400′ CSi; Peridontal techniques, 1200′ CSo; Plastic correction of extensive augioma of leg, 488′ CSi.

Ralph P. Sledge: The scalenus anticus syndrome, diagnosis and surgical treatment, 800′ CSi. Inf: Dr. E. M. Stevenson, Dept. Surgery, U. of Tenn., Memphis, Tenn.

Warren Sturgis: The physiology of normal menstruation, 800′ CSo. Inf: Schering Corporation, 2 Broad St., Bloomfield, N.J.

Julius Weber: Studies in blood circulation by cinephotomicrography; CSi; Low power cinemicrophotography with Zomar Lens, 200′ CSi.

All 16 mm, B=Black & White, C=Color, Si=Silent, So=Sound, Inf:=address for information on availability.

## II. FILM NEWS

Films shown at national scientific meetings:

American Association of Anatomists 16 films (Abstracts in 1948 *Anat. Rec.* 101:779-784).

American Society of Zoologists, 9 films. (Abstracts, *Ibid,* 101:697-701).

Society of American Bacteriologists 3 (Bacterial motility by Loveland, by Hutchinson & McCracken and by Pijper).

International Society of Hematology, 2 films (*Cf.* under III, below).

Federation of American Societies for Experimental Biology, 4 films. (Abstracts, *Fed. Proc.* 1948, 7:314).

Your committee received requests for film information from the following states: Maryland, Massachusetts, Minnesota, Kansas, New York, Virginia, Wisconsin, District of Columbia, and Washington.

Warren Sturgis writes that Sturgis-Grant Productions are making a series of films on congenital heart disease for the Department of Surgery, Presbyterian Hospital and the College of Physicians and Surgeons, NYC. Animation will be used for embryology and for circulation to show disease development before diagnosis and treatment.

Clyde A. Prusman plans a color-sound film on Controlling microorganisms for 1949.

Dr. Henry J. Cervantes, American Medical Information Service, 18 W. 55th St., NYC 19, is looking for medical films for exhibit in Latin American Countries.

McGraw Hill, NYC, announced that they are entering into the educational film field and have 27 sound films under production. *Film World,* 1947, 3:30.

The Association of American Medical Colleges passed a resolution to the United States Delegation to the World Health Assembly, urging the establishment in member countries national agencies capable of . . . "(a) providing leadership in perfecting, organizing and coordinating the production, dissemina-

tion and application of films and other audio-visual media in medicine, health and their related sciences; (b) representing effectively their respective national medical film interests with the World Health Organization and in their international relations so that maximum benefit can be derived from films and other audio-visual media in worldwide medical instruction, health education and medical research."—*J. Assoc. Med. Coll.,* 1948, 23:330.

The Medical Film Institute of the Association of American Medical Colleges is the title of a comprehensive description of the plan by W. A. Bloedorn, J. E. Markee and R. P. Walton. *J. Assoc. Am. Med. Coll.,* 1948, 23:361-370.

The second annual International Scientific Film Congress met in London Oct. 4-11. Delegates and observers were present from 25 countries and UNESCO. The main problems considered were: 1) A master card index of films from all the world and the formulation of a method of appraisal, 2) Joint production by a number of countries of films of common interest, 3) Wide exchange and distribution of films and custom's regulations involved, 4) Scientific film reference library, and 5) A Journal for the exchange of information. Painlevé was reported to have made the first television of camera and microscope to achieve live production shown in England. Sixty films were sent by 15 countries for showing and some of these were televised. Officers are: Pres. Jean Korngold (Poland), Vpres. John Maddison (Gt. Britain), and C. A. Burmester (Australia), Hon. secy. Jean Plainlevé (France), Hon. treas. Luc Haesaerts (Belgium). From *Science* 1948, 108:612 and Michaelis, M. *Nature* 1948, 162:826-827.

Mr. Jean Dragesco, Laboratorie d'Embryogénie Comparée, Collège de France, Paris, is compiling a survey of cinematography and invites all making motion pictures through the microscope to send him the following information: name, address, is equipment now in use? when used? film size, portable or permanent installation, universal or for special work, make of camera, kind of drive and speeds available, are camera and microscope independent? kind of viewer (beam-splitter), light source, whether an eyepiece is used, magnification, distance from microscope to film, a list of films made and a picture of the equipment.

The American Cancer Society is making films in cooperation with the National Cancer Institute at the professional level dealing with the early diagnosis of cancer. The first film is entitled "Cancer: the problem of early diagnosis" and the following five will deal with cancer at specific sites. The films are 16 mm Color with sound and will be available through State Cancer Societies, State Public Health Departments and four regional depots to be announced.

Ralph Creer reports that his "Films in Medicine" will be ready in a few months and will bring together information published in this field with considerable new material.

Dr. Morton writes that the following films have been received from BPA Member Dr. A. Pijper (Pretoria) and are available from the Society of American Bacteriologists' Committee on Materials for Visual Instruction (U. Pa., Sch. Med., Philadelphia 4): *Schistosoma haematobium,* eggs and miricidia; Yeast cells, germination of; *Treponema pallidium;* Growth of *Sporotrichium; Trichomonas vaginalis; Balantidium coli* and *Endamoeba histolytica,* all 100' 16 mm B&W Silent.

Correction 14th Motion Picture Committee Report page 140 *This Journal* 1948 volume 16. line 9 change 113-116 to read 429-432 and line 11 change 69-70 to read 625-626.

## III. CATALOGS

Animated Hematology, 2 reels, each 1600′ CSi. Discriptive catalog for each, 10 pp. Available to the medical profession. Dr. Florian E. Schmidt, Armour Laboratories, 1425 W. 42nd St., Chicago 9, Ill.

Army films on medical subjects available on a loan basis to the medical profession and allied scientific groups. 5 pp. mimeogr. 1948. Army Institute of Pathology. 7th and Independence Ave. S.W. Washington 25, D.C.

A catalog of certified professional motion picture films. Academy-International of Medicine, 214 W. 6th St., Topeka, Kansas. 1948. 110 pp. Second edition, with annotated titles and a list of film sources.

A partial list of 16 mm film libraries. Visual Aids Section, Office of Education, FSA, Washington 25, D.C. 20 page list of 600 sources. From *Science* 1948, 108:55.

## IV. PUBLICATIONS OF INTEREST FROM OTHER JOURNALS

Creer, R. P. 1948. Motion picture in medical education. *J. Assoc. Am. Med. Coll.,* 23:375-379.

Dragesco, J. 1948. La technique microcinématographique sur films étroits. *Microscopie* 1(2):M10-M40. A critical discussion of equipment and film planning, a description of portable equipment and the permanent installation at the College de France, list of 16 films made there and a 3 page bibliography.

Holinger, P. H., Anison, G. C., & K. C. Jackson. 1948. Bronchoscopic and esophageoscopic cinematography. *J. Thoracic Surg.,* 17(2):178-188.

LaRue, M. W., & M. W. LaRue, Jr. 1947. Adaptations and applications of 16 mm motion picture equipment to medical and scientific needs. *J. Soc. Mot. Pict. Eng.,* 49:241-247.

Ollerenshaw, R. G. W. 1947. Production of the surgical teaching film, *Phot. J.,* 87B:82-87.

Oscar W. Richards, Chairman
Box A., Buffalo 15, N.Y.
Ralph P. Creer,
Harry A. Morton.

---

## MEDICAL PHOTOGRAPHER

15 years experience, is interested in a position in a medical school or hospital in the South or Southwest. Robert A. Sage, 7514 Roper Street, Dallas 9, Texas.

# Intra-Oral Photography
# The Value of Correct Patient-Photographer Relationship

**Harold A. Thomas and John J. Beiter, F.B.P.A.***

DISCUSSIONS about intra-oral photography usually center about equipment, lighting, or positioning, all of which are, of course, very important. Success, or lack of it, in the use of even the finest of equipment or the best lighting is however, frequently dependent upon obtaining the proper cooperation of the patient, in avoiding tiring him out, and in getting him to assume positions which allow equipment and lighting to be used to best advantage. The purely mechanical considerations have been presented by numerous workers. Therefore, although it might be possible to add details to their work, these factors are not considered in this presentation, but instead we shall attempt to focus on those relations between patient and photographer which make it possible for the latter to achieve the best results. Technical devices will be considered only as they aid in this relationship.

It is best if notification of the requested photography is received from the physician personally. The photograph should not be ordered on a requisition form like a radiograph. Regardless of the skill of the photographer, he must have, as a minimum, detailed advice from the doctor if the picture is to depict the lesion to the greatest advantage, Figures 1 and 2. This information should be obtained from the doctor in advance if he is unable to be present at the time the picture is taken. Also, very often, he is able to suggest the best method of handling the patient. If personal discussion is impossible written instructions in full detail will have to be followed. The ideal situation is to have the doctor accompany the patient and be present throughout the entire procedure.

If the patient who appears for an intra-oral photograph were a normal, healthy person, the problem of cooperation would be relatively simple. But ordinarily he is not. Usually, he is sick and reacts differently,

* Received for publication February 19, 1949, from the Department of Medical Photography, Pathology Laboratories, Rochester General Hospital, Rochester, New York.

Figure 1. Written form requested only photograph of mouth, therefore the photographer showed lesion in right corner of mouth and on right cheek. This was not the pathology.

Figure 2. This photograph shows the open bite of the patient pictured in Fig. 1. This is the result obtained when the physician gives the photographer adequate information.

quite often adversely to the procedures that are necessary in the taking of a picture. In many instances, he has been examined several times, and is tired of having his mouth propped open, perhaps having suffered pain in the previous examinations or treatment. The patient is, therefore, usually afraid of any subsequent procedure, especially if he does not understand what is going to be done. Furthermore, a person

Figure 3. The need for retraction was demonstrated in Fig. 2. However, the use of retraction in the above illustration does not present the condition to the best advantage.

Figure 4. The growth of new teeth in this 37-yr. old cretin is shown best by having the patient smile, thus avoiding the use of retraction. (Same patient as shown in Fig. 3).

who is ill may be expected to react according to his instinctive and emotional make-up, including his sensitiveness to pain. Knowledge and application of these fundamental principles will be invaluable to the photographer in the handling of the patient; however, additional pointers may also be obtained from the referring physician.

Figure 5

Each patient is different and should be treated as an individual There is no set rule for dealing with patients and we must approach each as a separate problem. The first point is to determine the best possible way to handle him. When the doctor is present, the problem will be solved by following his example. If he is not, knowledge of the patient's make-up gained in the pre-photographic discussion, can be put to good use. If, in this discussion, the doctor does not volunteer any personal information about the patient, it is wise to ask him if he has any suggestions for handling the patient. Possibly the patient is the kind of a person who, by joking or wisecracking with, would be put at ease, thus making him more cooperative. On the other hand, some people when they are ill may resent others being too cheerful or gay, and so this treatment might do more harm than good.

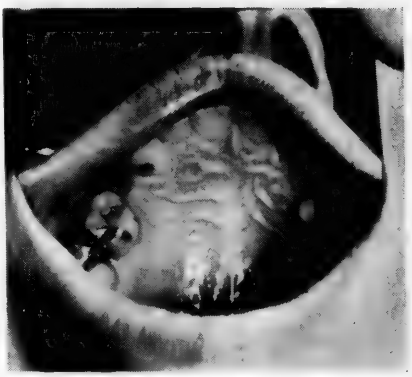


Figure 6

The photographer may be employed by the hospital, but as with all hospital employees, his salary is paid directly or indirectly by the patient. The patient should not be regarded as "just more work", but should command respect, consideration and attention due him as an employer. For example, the photographer should generally not smoke as the non-

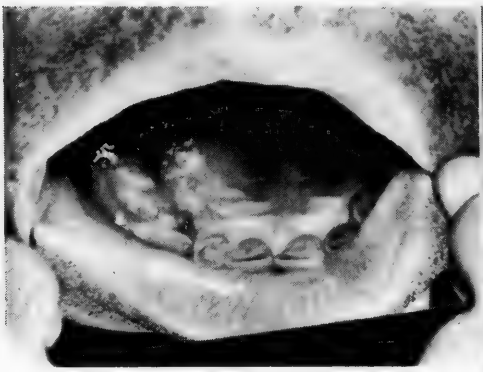


Figure 7. Only the part of the tumor on the gum is visible in this picture demonstrating the misuse of the mirror.

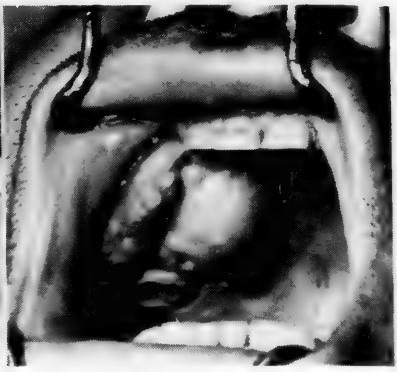


Figure 8. By using retraction, proper camera angle, etc., the tumor of the hard palate and the gum is very well depicted. (Same patient as shown in Figure 7.)

smoking patient is often disturbed by a smoky, hazy atmosphere, or the patient may have been advised by his physician not to smoke. We must always remember that basic rules of courtesy should govern our actions with the patient.

Most patients are completely unaware of what is going to happen and are, therefore, apprehensive. A friendly reassuring attitude will help put him at ease and the photography department should be operated with this aim foremost. The necessary equipment should be at hand so there is no fumbling. The personnel working with the patient and/or camera should be experienced, so that everything may be set up and the picture shot quickly and smoothly. If the patient is unable to speak or understand English, it is of great benefit to both the patient and the photographer if there is someone present who is able to act as an interpreter. As the comfort of the patient is also very important, every effort should be made to place the patient in a comfortable position with the head leaning securely against the head-rest, tipping the head in such a way, so that if possible, the lesion will still be seen by the camera in an ordinary position.

The terrifying sight of mouth gags and other complex apparatus should be eliminated. Simplicity of equipment is a *must.* It is preferable for photographic purposes to use cheek retractors and tongue depressors fabricated from unpolished chrome steel wire, as the usual broad gleaming chromium-plated instruments produce a distracting glare. Retractors and other instruments are wrapped in individual packages for sterilization. Make it a point to let the patient know that these

have been sterilized and are used for him alone.. A good method is for the assistant to get the "sterilized retractors" and undo the package in view of the patient. This simple procedure will help to reassure the patient that everything is being done for his best interests.

If the preliminary steps have been carried out with the patient's physical and mental comfort in mind, the actual procedure of exposing the lesion or area and taking the photograph will be much easier. After looking at the area to be photographed, the photographer usually is able to determine exactly what is needed to best present the pathology, Figures 3 and 4. As previously stressed, it is preferable that the physician be present. In the procedure of exposing the lesion, his services are invaluable as he is familiar with the condition of the patient and the technic of exposing the desired area. Because he has the confidence of his patient, it is much easier for him to be successful in the exposure of the lesion. If he is not present, one of the important points the photographer should always remember, is to avoid the use of too much retraction and/or too many instruments, because of possible discomfort to the patient or distortion of the pathology. The resulting confusion and optical image distortion present in the finished photograph is not only esthetically displeasing, but may even distract the attention from the center of interest, Figure 5.

If instrument retraction does not prove completely satisfactory, manual manipulation may be employed either separately or in conjunction with it. Lesions of the lips, gums and buccal surfaces are frequently better exposed by use of the fingers. When using the hands, they should

Figure 9. One retractor and the patient pulling out his own tongue gives a better photograph than one of same subject using two retractors as in Fig. 5.

Figure 10. Although his tumor is on the extreme posterior part of the tongue, complete cooperation and participation of the patient produced a successful photograph. (See also Figure 9).

be inconspicuous and if rubber gloves or finger cots are not employed, the nails should be clean and neat. There is nothing quite as bad as brightly colored or dirty fingernails, Figure 5. If a lesion on the tongue has to be photographed, the patient is usually able to "stick out" his tongue, in order to expose the lesion. It is amazing how far most people can "stick out" their tongue if they really want to. Therefore, the co-operation of the patient is invaluable when photographing the tongue. However, if it is necessary to pull out the tongue, in order to obtain traction, a 1 to 2 inch wide strip of gauze may be wound around the anterior portion, Figure 5. Ordinarily, the gauze should be kept out of the field of view. Only in rare instances, certain areas in the mouth cannot be adequately exposed for direct viewing and lighting, and in these cases a mirror may be used to advantage. This mirror should be of the first surfaced type so as to avoid double reflections which are present with the ordinary mirror. One disadvantage in the use of a mirror is that the picture either has to be mounted upside down or the people viewing it have to try to visualize the correct anatomical position, Figure 6. Also, the photographer should be absolutely certain that the mirror is necessary to show the lesion to best advantage, Figures 7 and 8. Frequently the patient's help must be enlisted in the manipulation, because the photographer, if he is alone, is unable to operate the lights, camera, etc., all by himself. This is not necessarily a disadvantage but may very well turn out to be exactly the opposite. The aid of the patient in the exposure of the lesion, gives him an actual part in the procedure and as the success of the photograph becomes partly his responsibility he is anxious to help. The holding of a retractor or pulling out of the tongue takes the patient's mind away from his own discomfort or pain, thus making him a better subject. This participation plan makes far better pictures possible particularly with patients whose mouths are extremely sore. Instrument retraction may be painful, but if the patient is doing the manipulation, he will probably not go beyond the point where pain begins, Figure 9. Nevertheless, if it is necessary to obtain more retraction or manipulation, and he is, for example, asked to pull a little more, the self-inflicted pain will be easier to withstand, resulting in better exposure of the lesion and much better pictures, Figure 10.

There is no set rule for the exposure of lesions. Occasionally, patients may, because of pain or general temperament, require a local anesthetic. Others, such as babies or small children, might need the use of general anesthesia. Each case should be studied and considered individually, and the method which gives the best result should be employed. When the pathology is apparently shown to best advantage, the ground glass image should be checked, for it is only at this vantage point that the

finished picture may be evaluated. If the doctor is present, he should also view the image, making sure it shows the desired medical aspects.

At this point in the proceedings some time has elapsed since the beginning, and despite all precautions, the patient is becoming tired or strained. We are about to take the picture, but some incidentals, such as inserting the film, cocking the shutter, etc., remain to be done. The patient may, because of any one of a number of reasons, not hold still, or try to remove the instruments. If these conditions are encountered, a little tact and consideration should be used. Occasionally, the photographer may feel exasperated, but in any event, the patient should not sense this. For example, the photographer might say, "If this bothers you, be sure and let us know, so we can remove the instruments and let you rest." Not only should the patient be cautioned against moving, but the reason should be explained. Simply say, "Do you suppose you could hold still just a little longer? or "Please try not to move as we are just covering a small area and the slightest movement will put this area out of the picture", or "If you can hold it just a little longer, it will be easier for both of us; if anything moves now, we'll have to start all over again." This concern over the patient's comfort works wonders and the position is usually maintained long enough to take the picture.

The welfare and comfort of the patient should be uppermost in our minds and common rules of courtesy should govern our actions, utilizing and understanding the reactions of a sick person. The advice and information from and/or presence of the physician should be a factor in determining the procedure of approaching and handling the patient. The importance of the correct manner in which to approach the patient cannot be overstressed. We should not take too long in arranging and shooting the picture as the patient may become jittery, tired, strained or disgusted. The correct choice of instruments and winning the patient's confidence and cooperation aids in successful retraction and manipulation to expose the desired area. The proper relationship between the photographer and the patient results in the achievement of good photographs and is often the difference between success and failure.

---

## Notice to BPA Free-Lance Workers

From time to time we receive inquiries about photographers available to take assignments in biological photography in various parts of the country. If you wish your name included on our sectional list of free-lance workers and have not already sent your name and address, please do so. Let us know the types of biological photography you are prepared to undertake. All information should be sent to the secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa.

# Contributing Members

Dr. S. Glidden Baldwin
139 Vermilion Street
Danville, Illinois

Dr. E. C. Baker
Youngstown Hospital
Youngstown, Ohio

Dr. Dennistoun M. Bell
"Broadview"
Amagansett, N.Y.

Dr Tibor Benedek
25 E. Washington Street
Chicago 2, Illinois

Lester V. Bergman
732 Eastern Parkway
Brooklyn 13, N.Y.

J. D. Brubaker
805 Greenleaf Street
Evanston, Illinois

Dr. W. A. "Don" Cammon
Cameron Surgical Specialty Co.
666 W. Division Street
Chicago 10, Illinois

Ralph P. Creer
American Medical Association
535 N. Dearborn Street
Chicago 10, Illinois

Dr. Edmond J. Farris
The Wistar Institute
Philadelphia 4, Pa.

Louis Paul Flory
Boyce Thompson Institute for
Plant Research
Yonkers 3, N.Y.

Dr. A. Wilson Footer
2828 Summit Street
Oakland 9, Calif.

Marjorie E. Francis
Visual Research Company
30 N. Dearborn St
Chicago 2, Ill.

Dr. J. P. Juhel
St. Francis Hospital
Cincinnati 14, Ohio

Dr. Jay M. Garner
723 Elm Street
Winnetka, Ill.

H. Lou Gibson
Eastman Kodak Company
Rochester 4, N.Y.

Ford B. Guerin
6310 Delmar Blvd.
St. Louis, Mo.

Dr. Paul H. Holinger
700 N. Michigan
Chicago 11, Ill.

Victor R. Landi
8211 Grove Street
Silver Spring, Md.

Henry M. Lester
101 Park Avenue
New York 17, N.Y.

Dr. Robert Mallory III
169 Milton Road
Rye, N.Y.

John A. Maurer
c/o Ansco
247 E. Ontario St.
Chicago, Ill.

Stanley J. McComb
Mayo Clinic
Rochester, Minnesota

Ray Miess
1810 N. Farwell Ave.
Milwaukee 2, Wis.

Henry W. Morris
Medical School Photo Lab.
Univ. of Minnesota
Minneapolis 14, Minn.

Leonard L. Perskie
Graphic Studios
231 - 10th Ave.
New York 11, N.Y.

Dr. Arthur W. Proetz
1010 Beaumont Bldg.
St. Louis 8, Missouri

Frank N. Ruslander
Harper Hospital
Detroit 1, Michigan

Albert Sadler
5736 La Jolla Blvd.
La Jolla, Calif.

Florian E. Schmidt, M.D.
320 Wisconsin Avenue
Oak Park, Illinois

Anne Shiras
University Office
Magee Hospital
Pittsburgh 13, Pa.

William J. Taylor
Temple University Hospital
Philadelphia 10, Pa.

Lloyd E. Varden
Pavelle Color, Inc.
533 West 7th Street
New York 19, N.Y

Julius Weber
425 West 263rd Street
Riverdale 63, N.Y.

# Association News

## New York Chapter Reborn

The first New York chapter was formed in 1934, with Mr. Louis Schmidt of the Rockefeller Institute as one of its founders. It had several active years, but after 1939 no further meetings were held. Our greatest membership concentration is in that city and lately some of our members have felt that it would be a benefit both to the national BPA and to themselves if the group were reorganized.

On the evening of December 8, 1948, in the auditorium of Cornell Medical College, some thirty BPA members from the metropolitan area met to form a new local chapter. The following executive committee was chosen to handle chapter affairs until officers are elected at the last meeting of the season: Lester Bergman, Carl Brinkman, Percy Brooks, Mrs. Mary Brown, Julian Carlile, Mrs. Margaret Frankow and Warren Sturgis. Mr. Brooks was named temporary chairman, and Mrs. Frankow, Department of Dermatology, College of Physicians & Surgeons, 630 W. 168th Street, New York 32, N. Y., secretary-treasurer.

At the second meeting, on January 19th, Dr. Farris, the national president, came from Philadelphia to extend personally his greetings and best wishes. About fifty people attended.

The programs offered by the new chapter will be listed with this season's other chapter programs in the last number of the present volume.

## News of Our Members

It is always interesting to receive professional news items from our members. All members are invited to tell us about themselves on the renewal blank. We wish more would do so.

If the items concern motion picture work they are forwarded to Dr. Richards and are published in the report of his Motion Picture Committee. His report appears in this issue. The following are reports of a general nature, or of new undertakings in still-photography.

*Miss Winnifred Arnold,* photographer at the University of Michigan Dental School, Ann Arbor, Michigan, is making a photographic exhibit in color on oral cancer, to be used for teaching and public display by the National Cancer Institute. At the same time a complete set of color slides will be made for lectures on this subject.

*Earl Bartlett,* who graduated from the Rochester General Hospital School of Medical Photography, Rochester, N.Y. in December 1948, is remaining in the Photographic Department of that hospital as assistant to John Beiter, F.B.P.A.

*Rush Maxwell Blodget, Jr.,* M.D., 1613 Fairmount Avenue, La Canada, Calif. is working on color-photography of the external eye, and of the ocular fundus. He is attempting to cut down the long exposures (about ½ sec.) which his apparatus for fundus photography has necessitated up to the present. When last heard from, he had succeeded in getting good color shots at 1/10th sec. He is also doing photomicrography in color in the field of ophthalmology.

A new endoscopic camera for still-photography with flash-bulbs is being made by *J. D. Brubaker*, 805 Greenleaf Street, Evanston, Ill. The new model takes a slightly larger picture than the original endoscopic camera designed by Mr. Brubaker, and incorporates other improvements.

*Esther B. Clark, M.D.,* Palo Alto Clinic, 300 Homer Avenue, Palo Alto, Calif., who was recently brought into the BPA by John Fallon, M.D., is establishing a photographic department to be used jointly by the Palo Alto Clinic and the Palo Alto Medical Research Foundation.

*L. Earl Deane*, 1813 W. 25th Street, Cleveland 13, Ohio, has designed new models for electronic speed-lighting equipment, in either a.c. or battery-operated portable models. The color-temperature is satisfactory for color photography. He also has in production a self-powered triggering device weighing four pounds, called "Lite-Mite', which is capable of firing twelve flash-lamps at one time with cables up to 200 feet. And he has produced a back-light unit which can be used as illumination for fluorescing substances, or as a proofing light faster than sunlight. Other items are: An intensity-control switch, capable of controlling a battery of photo-floods; and a battery charger for use with portable strobe lights.

The Department of Physiology of the University of Connecticut, Storrs, Conn. is obtaining permanent records of the action potentials of frog sciatic nerves, etc. by means of time-exposures taken by *Irving Diamond.*

*C. W. Getzendaner* of the U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Box 278, Forest Grove, Oregon, is making a complete photographic coverage of the methods and equipment being tried for insecticide application with special reference to airborn equipment.

Work on the adaptation of equipment for rapid routine intra-oral photography is being undertaken by *Bernard Jankelson, D.M.D.,* 652 Stimson Building, Seattle 1, Wash., with special concern for increasing the depth of field.

A black-&-white print titled "Leafhopper Stylets in Sugar Beet Petiole" won Honorable Mention for our member, *Charles F. Lackey*, of

the U.S. Department of Agriculture, Riverside, Calif., in the Second Annual International Photography-in-Science Salon. This Salon is sponsored by the Smithsonian Institute and an official publication of the American Association for the Advancement of Science, "The Scientific Monthly." It is on a tour of American cities and will go to London next winter for a showing at the Royal Photographic Society.

*Maxwell Leon,* 8615 Eliot Avenue, Rego Park, N.Y., reports as work recently undertaken a series of photographs of skin manifestations from allergic, dermatologic and mycologic studies.

*Albert Sadler,* FBPA, has moved from Eloise, Mich. to 5736 La Jolla Boulevard, La Jolla, Calif. as a partner in a new store to be opened there. Mr. Sadler will handle the photographic end of the business, and the darkroom work. His position at the Wayne County General Hospital, Eloise, Mich. has been filled by one of our members, *Ronald M. Christopher,* formerly of the Veterans Administration Hospital, Temple, Texas.

*Ralph Sledge*, 902 Goodman Road, Memphis 11, Tenn. is doing intravesical photography in color, using a cystoscopic camera developed by Dr. Lowrain McCrea, BPA, Temple University, Philadelphia, Pa.

*H. Wolfgang Zieler* has moved from New York City to the Debs Hospital Supply, Inc., 118 S. Clinton St., Chicago 6, Ill. He is organizing a department which will provide and service scientific equipment for hospitals. As he has been an active BPA member since 1934, one of his first moves on reaching Chicago was to affiliate with our local chapter there.

## Election of Officers and Directors

Elections will be held in Cleveland during the annual meeting, September 7-10. The terms of the following officers and directors expire in September 1949:

| | |
|---|---|
| *President* | Dr. E. J. Farris |
| *Vice President* | Dr. Oscar W. Richards |
| *Secretary* | Miss Anne Shiras |
| *Treasurer* | Miss Stella Zimmer |
| *Directors* | Mr. C. Graham Eddy<br>Mr. Louis P. Flory and<br>Mr. Albert Levin |

The official ballot will be mailed to the members at least one month before the election. The name of any candidate suggested in writing to the Secretary by 10 or more members will appear on the official ballot along with those nominated by the Nominating Committee. The Secretary's address is : Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa. Members of the Nominating Committee appointed by the President and approved by the Board of Directors are: Mr. William Payne, Chairman, 205 Hewitt Avenue, Buffalo 15, N. Y.; Mr. Julian Carlile, Department of Animal & Plant Pathology, Rockefeller Institute for Medical Research, Princeton, N. J.: Miss Avis Gregersen, Department of Dermatology, University of Southern California Medical School, 1200 North State Street, Los Angeles 33, Calif.

# RECENT ARTICLES AND LECTURES, FEATURING PHOTOGRAPHY BY OUR MEMBERS:

"Photographic Studies of Fresh-Water Algae," *Edna Campbell Barker*, Water Department Laboratory, Park Administration Building, San Diego, Calif. in the "Taste and Odor Control Journal," Vol. 14, No. 8, August 1948.

In December 1948, *Ralph Creer*, FBPA, Motion Picture Committee, American Medical Association, Chicago 10, Ill. spoke to the staffs of the Royal Victoria Hospital and McGill Medical School, Montreal, Canada, on "The Use of Visual Aids in Medical Teaching."

"The Photographic Museum," *John Fallon, M.D.*, 10 Institute Road, Worcester, 2, Mass., in the "New England Journal of Medicine," Nov. 11, 1948; 239.

"How to Use Polarizing Filters," *H. L. Gibson*, FBPA, Eastman Kodak Co., Rochester 4, N.Y., in "Camerette" Dec. 1947; 55.

"Paste-up Montages and Retouching Technique," *H. L. Gibson*, FBPA, Eastman Kodak Co., Rochester 4, N.Y., in "Camerette" May, 1948; 60.

"Give Life to a Child," a publication issued by the Children's Medical Center, Boston describing the eighty years of service of the Children's Hospital, is profusely illustrated by *Ferdinand Harding*, FBPA, Children's Medical Center, Boston 15, Mass.

"The Southwest—Land of Color and Contrasts," *Lloyd Henbest*, 302 U.S. National Museum, Washington 25, D.C. This talk at the Museum, under the auspices of the National Parks Service Department of the Interior, was illustrated with color-photographs and with thin-sections of rock and mineral directly projected through a Polariscope of Mr. Henbest's design.

"Electronic Flashtube Illumination of Specialized Motion-Picture Photography," *Henry M. Lester*, 101 Park Avenue, New York 17, N.Y., in "Society of Motion Picture Engineers Journal," March 1848. News of this article did not reach us in time to be included in the items forwarded to the Motion Picture Committee, and so is included here.

"Crystal Forms in Soils Observed in the Electron Microscope," *W. Z. Mackie* (with B. Chatterjee and M. L. Jackson) Soils Department, University of Wisconsin, Madison 6, Wis., in "Proceedings," 1947, Soil Science Society of America, Vol. 12.

"Illumination of Deep Cavity Surgery for Color Photography," *F. M. Nielson*, New York State Department of Mental Hygiene, Albany, N.Y. Talk given before the 64th Semiannual Convention of the Society of Motion Picture Engineers, Washington, D.C. in October 1948.

"My Camera and I Aid the Doctor at Work," *Albert Sadler*, FBPA, 5736 La Jolla Boulevard, La Jolla, Calif., in "The Public Employee," December 1948, Vo. 12, No. 10.

"Organization and Activities of a Pathology Museum," *Margaret Schell*, Woodlawn Hospital, Chicago 37, Ill. in "Special Libraries Magazine" December 1948. The filing and use of photographs as well as actual specimens are described.

"One Step Photographic Processes," *Lloyd Varden*, FBPA, Pavelle Color, Inc., 533 W. 57th Street, New York 19, N.Y. Journal of the Photographic Society of America, September 1947, Vol. 13, No. 9.

"Sensitometry of Multilayer Photographic Materials," *Lloyd Varden*, FBPA, Pavelle Color, Inc., 533 West 57th Street, New York 19, N.Y., in "American Photography," October 1948, Vol. 42, No. 10; continued in the issue of November Vol. 12, No. 10.

"Skin Manifestations of Internal Disorders," *Kurt Wiener, M.D.*, 425 E. Wisconsin Avenue, Milwaukee 2, Wis., The C. V. Mosby Co., St. Louis, Mo., 680 pages, 436 pictures.

Among the illustrations in an article "Ansco Color Film in Science," published in the "Ansconian," November-December 1948, Vol. 12, No. 6, are two sets of photomicrographs. One pair was contributed by *Stella Zimmer*, FBPA, College of Medicine, Syracuse University, Syracuse 10, N.Y., showing diatoms in one picture, and in the second, a cross section of a hookworm taking a bite of intestine. Our member *John Butterfield*, Bausch & Lomb Optical Co., Rochester, N.Y., made the other pair, showing asparagine crystals in polarized light.

---

## Articles Wanted on Photographic Techniques

The editors of "Photographic Age Magazine" are looking for articles dealing with new developments in photographic techniques. If you are interested in describing some research project in which the camera plays an important part, or some new method of obtaining scientific illustrations, get in touch with Mr. Norman Silverstein, Editorial Dep't, "Photographic Age", 460 Bloomfield Ave., Montclair, N. J.

## Key Available to BPA Members of 5 Years Standing

A gold key, official emblem of the BPA, is available to those who have been members of the BPA for five or more continuous years. The emblem features a camera and a microscope, with a design resembling motion picture film along the two sides of the key.

It may be ordered from the L. S. Balfour Co., 1601 Chestnut Street, Philadelphia 3, Pa. for $8.75 plus 20% Federal Tax and any State tax in force in the member's locality. The above price includes the machine-engraving on the back of the key of the member's name (two initials and the last name) and date of joining the BPA. Additional data, such as the initials FBPA, date of receiving Fellowship, charter membership, etc., may be ordered for 2c per machine-engraved letter or numeral.

A pin, and safety catch can be applied when requested, at an added cost of $1.00 (subject to above taxes).

A jewelled version of this emblem will be given to each winner of the BPA Annual Award. Mr. Leo Massopust, FBPA, School of Medicine, Marquette University, Milwaukee 3, Wis., is the first recipient of the jewelled key.

# Preliminary Studies of Human Carcinoma with the Polaroid Color Translation Ultraviolet Microscope†*

**Robert C. Mellors, M.D., Ph.D.****

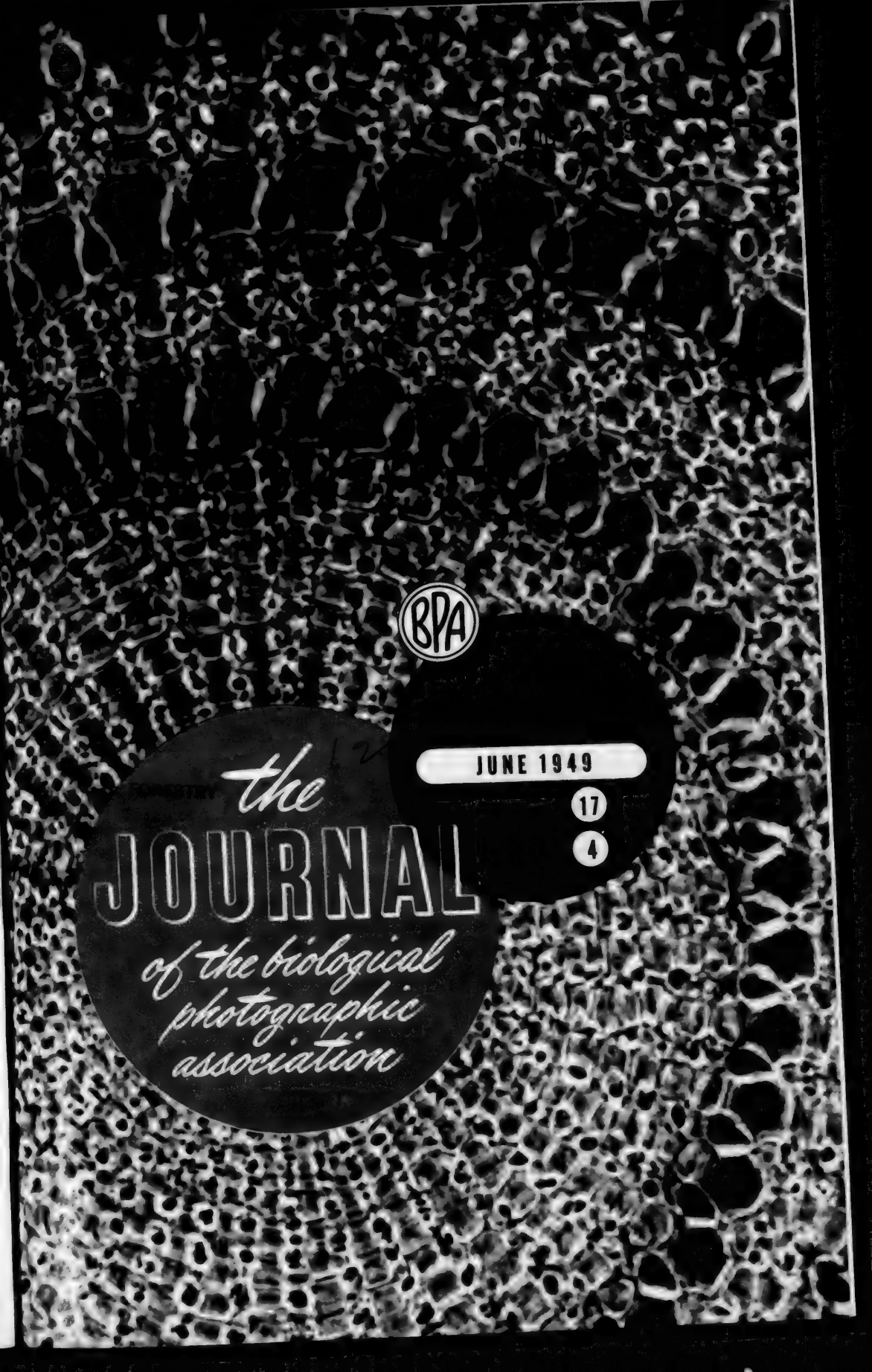
ULTRAVIOLET photomicrographs of tissues taken in succession at 265, 285, and 305 millimicrons with the Polaroid design reflecting ultraviolet objective and translated in full color by the Polacolor process are satisfactory for histologic study, within the limits of resolution of the lens. The structure, the structural array, and the composition of the cells determine the different characteristics of normal tissue and carcinoma in the color translation ultraviolet photomicrographs. While it is reasonable to assume that at the particular wave lengths studied, the distribution and the amount of nucleic acids within the cell determine, in great part, the appearance of the color translation ultraviolet photomicrograph, it is not permissible, at this time, to put forth an interpretation of color translation differences in terms of specific chemical differences.

† Abstract of a paper presented to the Biological Photographic Association, (1948).

The Sloan-Kettering Institute for Cancer Research, Memorial Hospital Center, New York, N.Y.

* This work has been presented in part to the American Federation for Clinical Research (1948) and the A.A.A.S. Cancer Research Conference (1948).

** Fellow in Cancer Research of the American Cancer Society. This work was done in part under a fellowship grant of the American Cancer Society recommended by the Committee on Growth of the National Research Council.


BPA
JUNE 1949
17
4
the
JOURNAL
of the biological
photographic
association

# *Nineteenth Annual Meeting of the B. P. A.*

**Hotel Cleveland, Cleveland, Ohio — September 7-10**

The Board of Directors and the Northern Ohio Chapter of the B.P.A. extend a hearty invitation to all members and their guests to attend the 19th Annual meeting of the national B.P.A. The progam is given elsewhere, but before turning to that, let us urge you to attend the official luncheon on Wednesday, Sept. 7, and the informal smoker that evening, two events which will help us all to become acquainted early during the meeting. The Honors Award Dinner will be held Friday, Sept. 9. We are happy to have Dr. Otto Glasser of the Cleveland Clinic Foundation as our guest and speaker. The dinner will be informal for the men; formal or informal for the ladies, whichever they individually prefer.

Please note that the Hotel Cleveland is directly connected with the Union Terminal so no taxi is needed for those who arrive at this station. (All railroad lines run into the Union Terminal except the Pennsylvania, which goes to the 9th St. Station). Except for the afternoon at Nela Park, the Hotel Cleveland will be headquarters for all Convention activities. Get your reservations early.

For general information write to the *Convention Chairman,* Mr. David Lubin, 130 Keats Lane, Berea, Ohio, or to the *B.P.A. Secretary,* Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa. For matters pertaining to the program write to the *National Program Chairman,* Dr. Oscar Richards, American Optical Co., Buffalo 15, N.Y. *The Technical Exhibit Chairman* is Mr. Fred Beal, St. Luke's Hospital, 11311 Shaker Heights Blvd., Cleveland 4, Ohio, and our apologies are due him for not listing him as such in the Journal for March 1949. A list of the other Committee Chairmen and their addresses will be found on pages 101-102 of that Journal, Vol. 17: No. 3.

# The JOURNAL of the Biological Photographic Association

Volume 17 • JUNE, 1949 • Number 4

Official Publication of the Biological Photographic Association

COPYRIGHT, 1949

## CONTENTS

Guggenheim Fellowships in Photography ..... 154

Studies with The Lifwynn Eye-Movement Camera.....Trigant Burrow, M.D., Ph.D. and Hans Syz, M.D. 155

A Variable Control X-Ray Illumintor and Sopy Stand.....Albert Sadler 171

New Typewriter Speeds Up Preparation of material for Making Lantern Slides .....Robert D. Wolf 177

Preliminary Program ..... 179

Exhibits for the Scientific Photographer ..... 181

B.P.A. Facts and Figures ..... 182

News of Our Members ..... 183

Officers and Directors for 1949-1950 ..... 191

Index 1932-1949 ..... 192

*Leo C. Massopust, Editor*

Marquette University School of Medicine

Milwaukee 3, Wisconsin

A S S O C I A T E E D I T O R S

ARTHUR W. PROETZ, M.D., Beaumont Building, St. Louis, Mo.; ANNE SHIRAS, School of Medicine, University of Pittsburgh, Pa.; FERDINAND HARDING, The Children's Hospital, Boston, Mass.; and ARTHUR W. FUCHS, 164 Inglewood Drive, Rochester, N. Y.

Published Quarterly at 561 North 15th Street, Milwaukee 3, Wisconsin. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $5.00 per volume; foreign countries $5.50. Single copies $1.25 in U. S. A.

# Guggenheim Fellowships in Photography

The Guggenheim Foundation was established by the late Senator Simon Guggenheim and Mrs. Guggenheim in memory of their son who died in 1922. It is the purpose of the Foundation to help men and women undertake research in any field of knowledge, and creative work in any field of the fine arts. The Fellowships are awarded by the Trustees of the Foundation upon nominations made by the Committee of Selection.

Appointments to Fellowship are given to men and women of high intellectual and personal qualifications, who have already demonstrated unusual capacity for productive scholarship or outstanding creative ability in the fine arts. Citizens of the United States of any race, color or creed are eligible. Ordinarily the awards are made to married or unmarried candidates of 25 to 40 years of age, but in exceptional cases full consideration is given to older persons.

Appointments are usually made for one year, carrying a stipend of from $2,500 to $3,000. Plans involving a longer or shorter period will be considered by the Committee of Selection as the tenure of Fellowship can be adjusted to the purpose and scope of each project. Scope, direction and objectives of Fellowships rest with the applicant, who must satisfy the Committee of Selection that success is promised by personal capacity, creative ability, experience, and achievement. The Foundation seeks to improve the quality of education and the practice of the arts and professions in the United States, to foster research, and to promote better international understanding. The value and practicability of projects toward achieving these aims are judged by responsible scholars and artists cooperating with the Foundation.

Fifteen Fellowships already have been awarded in the fields of black-&-white photography, color photography, motion picture photography, and scientific and historical research in photography and films. Applicants who receive Fellowships are required to devote such time to a project as to prohibit outside employment. Findings are reported to the Foundation, but Fellows otherwise may sell manuscripts, articles, or books based on their personal work. Applications for Fellowships, with definite statement of contemplated projects, are made on or before October 15 of each year. Copies of prescribed application form are obtained from Henry Allen Moe, Secretary General, John Simon Guggenheim Memorial Foundation, 551 Fifth Avenue, New York 17, N.Y. Applications for reappointment are received before February 1 each year.

# Studies with The Lifwynn Eye-Movement Camera[1]

**Trigant Burrow, M.D., Ph.D., and Hans Syz, M.D.**

THE Lifwynn eye-movement camera is employed in connection with studies in behavior and its disorders, carried on by The Lifwynn Foundation. These investigations of behavior-disorders led to the demarcation of two types of attention. This demarcation is important as it bears upon the understanding of behavior pathology, both individual and social. One type of attention, designated as *ditention,* is found to exist in normal as well as in neurotic individuals. It embodies a self-conscious deflection of interest concomitant to wishful thinking and non-objective motivation. It appears to constitute the dynamic background to which behavior-disorders, both clinical and social, are to be traced. The other form of attention, designated as *cotention,* is characterized by a non-affective, socially inclusive attitude and motivation. This type of attention represents a more basic, biologically adequate and integrated form of adaptation—an organismic constellation which contains the prerequisites for healthy development and behavior. Cotention can be brought about through the appropriate technique in the management of internal tensional patterns.

It was found that both types of attention are accompanied by characteristic physiological features. As compared with ditention, we find in cotention a slowing and deepening of respiration, a reduction of the alpha component in the electroencephalographic curves and certain characteristic differences in the eye-movements. For the instrumental recording of the eye-movements we made some experiments with cameras constructed in other laboratories (with G. T. Buswell's two-film camera and with the camera of H. E. Thompson and L. E. Luce), but we found it desirable to develop a camera that would meet our special requirements. This camera, which is described below, was designed and built by Dr. Henry Roger and Mr. Charles Robinson in the former's laboratory at Sandy Hook, Connecticut.

The apparatus (Figure 1), which combines the principles of a still camera with certain features of the motion-picture technique, consists

Received for publication April 30, 1948 from The Lifwynn Foundation, Westport, Conn.

[1] Read at the Eighteenth Annual Convention of the Biological Photographic Association, Philadelphia, September 9, 1948. The material of this paper has been published previously in a more extended report by the authors, "Two Modes of Social Adaptation and Their Concomitants in Ocular Movements," *The Journal of Abnormal and Social Psychology,* April 1949, Vol. 44. It is published here with the permission of the *Journal* and of the American Psychological Association.

of three main units: the camera proper, a light source, and a control unit, with their connecting cables. Except for the focusing of the camera, all functions of the apparatus are controlled from the panel of the control

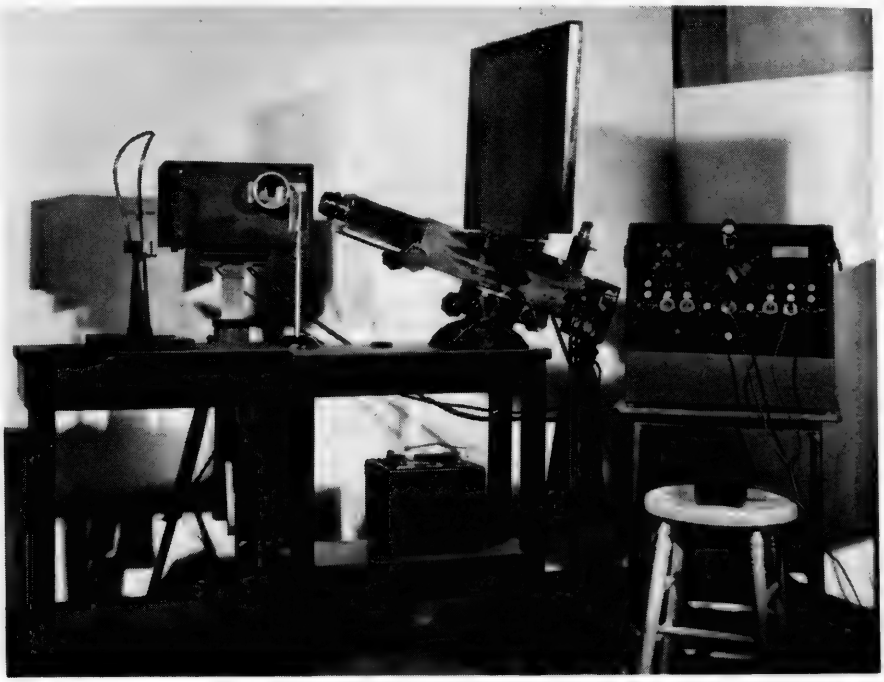


Figure 1. Lifwynn Eye-Movement Camera.

box or from its push-button extensions. The operation may be made completely automatic, semi-automatic or manual.

The subject is seated at a desk or table, provided with a firm but comfortable headrest, facing the camera. The operator is seated directly behind the camera with the control unit within easy reach at his side. On top of the camera is mounted a large black board which serves as support for visual material and which is provided with lights in the center and at the four corners of a one-foot square. The lights may be turned off and on individually to serve as points of reference in the field of vision. The board also acts as a shield between the subject and the operator.

The *camera* is of the reflex type with the finder mounted vertically behind the board. The anastigmatic photographic lens of 18 cm. focal length (Zeiss Tessar, 1:4.5) is mounted at the extremity of a square

tube which is adjusted for focusing by means of a rack and pinion controlled by knobs on both sides of the camera. The camera is mounted on a tripod head with knobs providing for vertical and horizontal adjustment. Inside the camera, directly below the finder, is a surface mirror mounted at a 45-degree angle. This mirror also acts as a shutter and is actuated by a solenoid which opens it automatically when an exposure is to be made. Thirty-five mm. motion-picture film is used and is held in a conventional film gate. The frame is changed automatically by a solenoid-operated device. The frame-change mechanism consists of a modified motion-picture camera mounted on a plate fitting into a slide on the rear of the camera body. Any other type of camera may be mounted in its place on a similar plate. The film is fed from a small magazine mounted above the film gate and out through a tube at the bottom of the camera into a light-proof container. In the bottom of the camera is a blade to cut the film at the end of an experiment.

At one side of the camera is a *light source* (Figure 2) which is contained in a metal box approximately 8 by 8 by 12 inches. On the front of the light source is a barrel containing a three-inch lens and provisions for mounting a small mirror which reflects the light into the subject's eye. At the base of the lens barrel is a two-position slide for holding infrared and ultraviolet filters. A dial is located in an aperture directly inside the box. As may be seen on the figure, the dial consists of a circular pattern with an arm projecting from its circumference. Provision is made for exchanging the dial patterns which are cut from small metal strips fitting into a slide. Any dial shape which clearly indicates small degrees of rotation may be used. The dial is mounted in the center of a ring gear which is driven at one revolution per second by a synchronous motor. In direct conjunction with the dial is a cam which closes a switch once per revolution, actuating the automatic frame change of the camera, thus giving one frame per revolution (per second) in the automatic position. The length of exposure may be extended by manual operation, but in most of the experimental settings the one-second exposure was found especially practical because

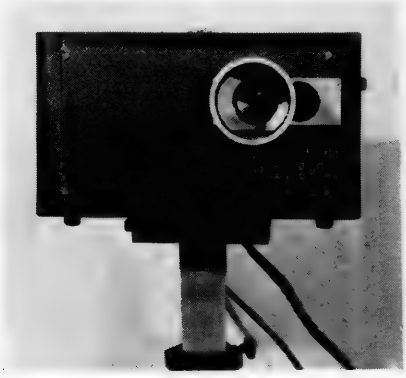


Figure 2. Light source.

it avoids crowding of dial impressions and also duplication of positions of the dial image.

Directly behind the dial is a General Electric FT 214 flash tube. This tube flashes at convenient predetermined speeds, from five to twenty flashes per second. The light flashes are projected through the moving dial and optical system to the cornea of the eye, and from the cornea to the film. Since the photographic images of successive exposures give successive positions of the rotating dial, one can follow the course of the eye-movements by observing the sequence of the dial impressions. For focusing, there is a small incandescent lamp located directly behind the flash tube.

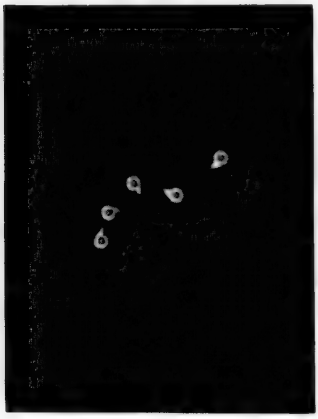


Figure 3. Photogrm of eye-movements, five exposures per second. The dial moves clockwise in all illustrations. The course of the eye-movements can be determined by following the successive positions on the dial.

Figure 3 shows a sample of the dial impressions thus obtained on the film taken at the frequency of five exposures per second. One may trace the eye-movements by following the dial positions in clockwise succession.

The frequency-dtermining apparatus is located in the *control box* (Figures 4 and 5). The rates of flashing are determined by an electronic circuit consisting of an 884 gas-filled tube. The frequency-determining elements are properly proportioned resistances and capacities which are connected in the plate circuit by means of a rotary switch mounted on the control panel. To assure the stability of the frequencies they are sub-multiples of the 60-cycle line frequencies. A 60-cycle voltage is injected into the grid circuit of the tube for this purpose. In order to further assure stability, the plate voltage is regulated by two VR 130 regulator tubes. The plate of the 884 tube is coupled to the grid of a 6 L 6 amplifying and pulse-sharpening tube. The output of this tube overcomes a fixed bias on the grid of an FG 17 thyratron tube, causing it to discharge a condenser through the primary of a high-tension ignition transformer which ignites the flash tube. The condenser and transformer are mounted in the dial box with the flash tube, and are connected to the control box by a high-tension cable.

An 866 A tube rectifies the output of a 1500-volt transformer and charges an 8-microfarad condenser which furnishes the voltage for the

flash tube. It also charges through a 20,000-ohm resistor the 2-microfarad condenser which is discharged through the thyratron and ignition transformer previously referred to. These components are also mounted in the control box except for the ignition transformer, the 2-microfarad condenser and charging resistor which are in the dial box.

The control box (Figure 6) is 14½ in. wide, 18 in. long and 16½ in. deep, with a sloping front panel upon which are mounted the various

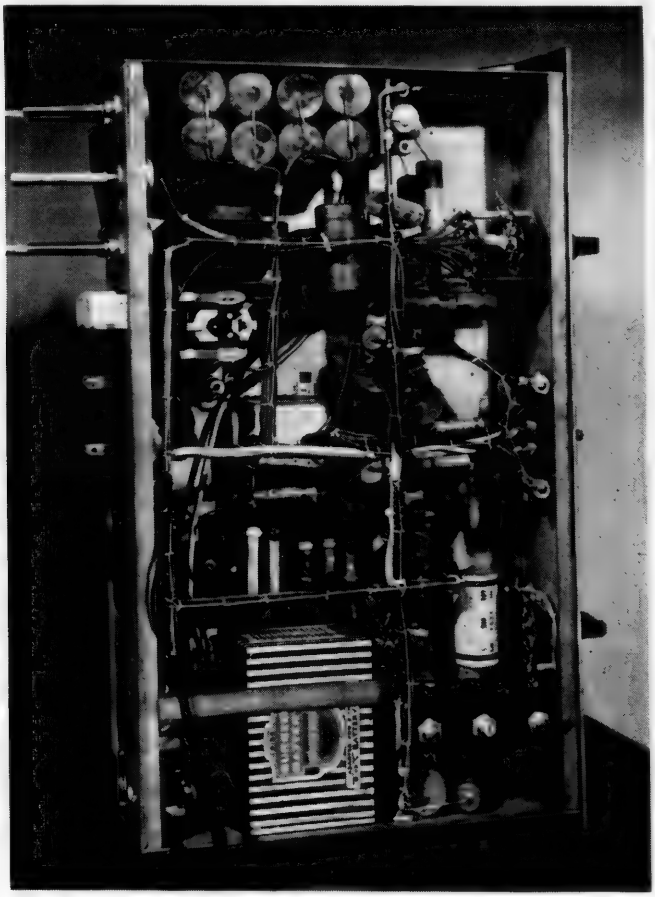


Figure 4. Control box. Interior arrangement of electronic equipment.

controls. At the bottom of the panel is the power switch with two pilot lights. There are two separate power input cables. The switch closes the circuit supplying the control voltages and power for the frequency-determining circuit. This circuit is indicated by the red pilot light.

When the circuits are in operating condition, a relay automatically closes the other circuit which supplies the high voltage for the flash tube. The green pilot lamp is lit, and the apparatus is ready to operate.

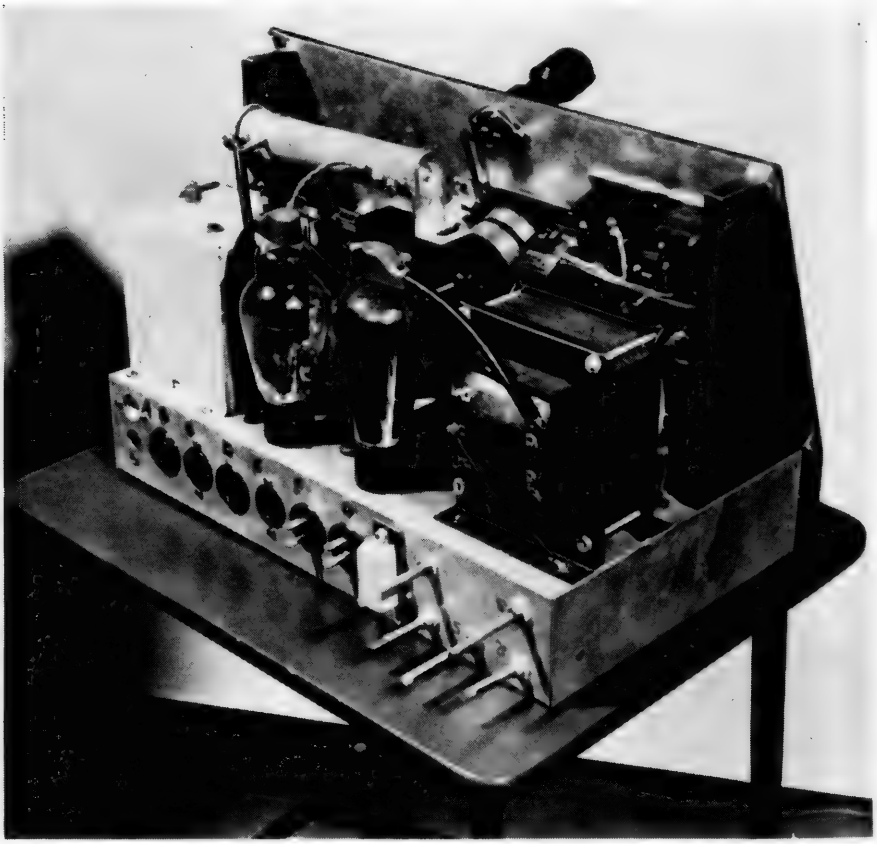


Figure 5. Control box — tubes and condensers.

In the center of the panel above the power switch is a one-minute timer dial. When completely automatic operation of the camera is desired, the timer is set for a predetermined period. With the timer set for the desired time, it is only necessary to press a button at the end of a cable which has been plugged into the automatic position. The timer operates a relay that energizes a solenoid which opens the shutter of the camera. When the shutter is fully opened, it closes the circuit supplying current into the flash tube and dial motor. The flash tube flashes at the rate determined by the setting of the control at the lower left of the panel. The dial turns at one revolution per second, and each

revolution closes a contact energizing the frame-change mechanism. When the timer comes to the end of the set period, the shutter-relaying circuit is opened, thus closing the shutter and disconnecting the flash tube, dial and frame-change circuits.

At the right of the panel are the controls of the frame-change circuit. In the automatic position, the frame change occurs once per dial revolution. With the switch in the manual position and the remote-control cable plugged into the socket provided for it, the frame will not change unless the remote-control button is pressed. But then it will change only on an even second as determined by the dial contact. There is also a push button located on the panel by means of which random frame changes may be made. Just to the left of the frame-change position is the timer-control position. By turning the switch to manual position and plugging the cable into the adjacent socket, the apparatus will function as long as the button is held down, and the timer will record the time.

Figure 6. Control box — all functions of the apparatus are controlled from the panel of the control box or its push-button extensions.

To the left of the timer is the shutter-control position. With the switch turned to manual and the cable plugged into the adjacent socket, the shutter is opened and the other functions of the apparatus proceed while the button is being pressed.

On the left of the panel is the dial-control position. With the switch turned to manual and the cable plugged into the adjacent socket, the dial and flash tube operate when the button is pressed, but the camera shutter and frame change are disconnected. This position is convenient for visual observation of the patterns or for focusing the camera.

Just to the right of the center of the panel below the timer is a switch which remains in the automatic position when operating directly from the timer but must be turned to manual for any of the other sequences.

Just to the left of the center below the timer is a switch which must be closed before and after the even minute if the timer is to control an experiment automatically for more than one minute.

At the extreme left of the panel is a switch which turns on the

focusing light. In the lower left and right corners are 110-volt convenience outlets with switches. At the top of the panel is another outlet for panel illumination.

It is impossible to operate the camera unless the switches are set in proper sequence. In case of improper setting, the apparatus is so designed that no damage can result.

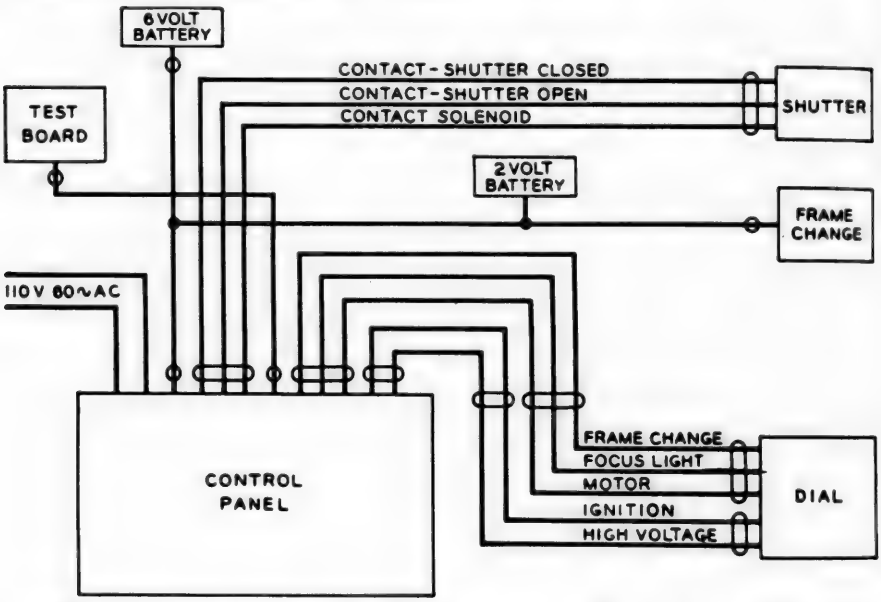
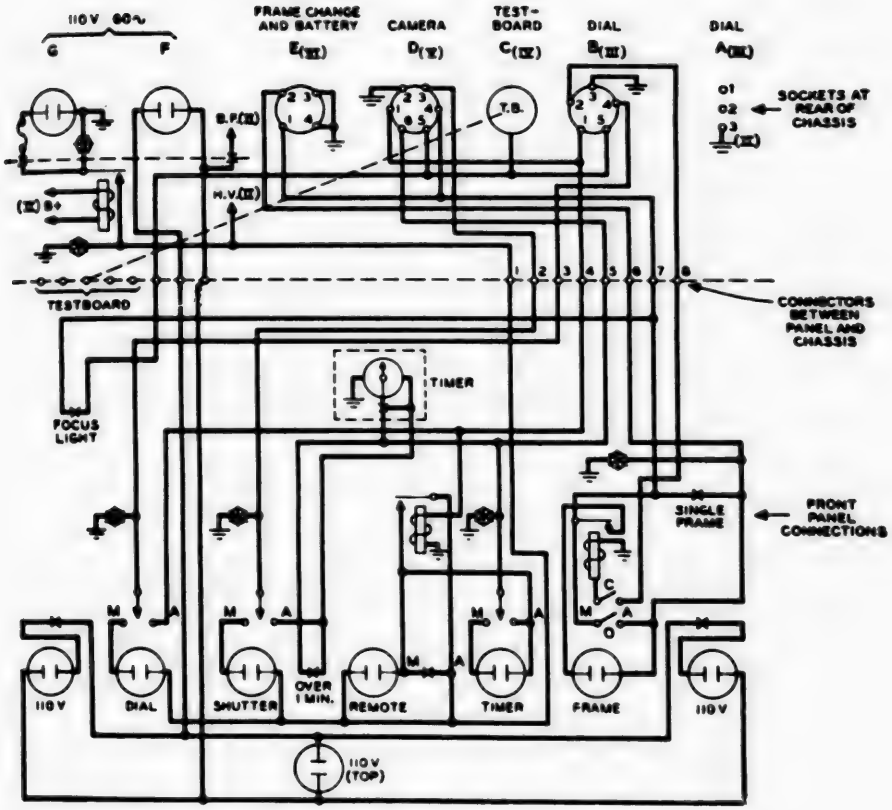



**Figure 7. Electrical cable connections of the control box with the frame-changing device and with the light source.**

Figure 7 presents a diagram of the electrical connections of the control box with the frame-changing device of the camera and with the mechanism of the light source.

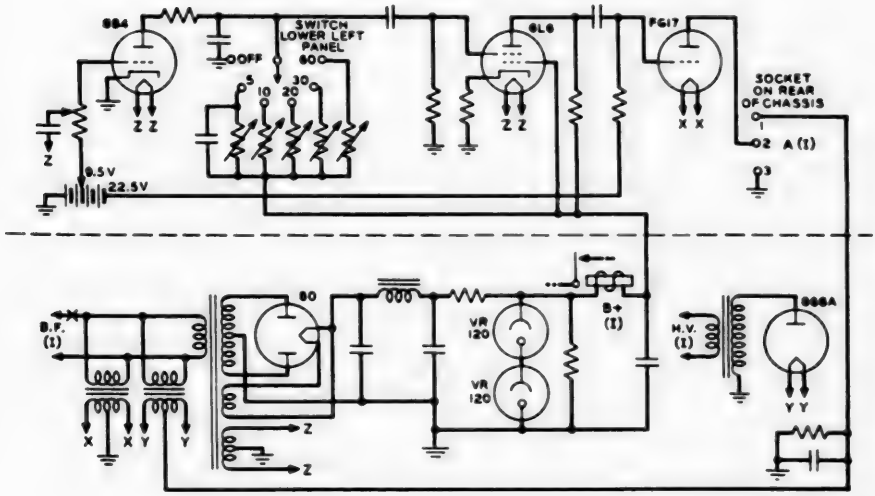
Figures 8-11 give diagrams of the electrical mechanisms and connections of the various parts of the apparatus. The Roman digits in parentheses within these diagrams show the location of electrical connections from one of the six diagrams to another, the numbers indicating the diagram with which the connection is made.

For the *projection* of the developed films a Tri-Purpose Picturol Projector, Model AAA, of the Society of Visual Education was used. We mounted this projector on a wooden plate which fits into the slide of a small wooden table placed on the work table to the left of the operator, so that he can conveniently adjust the frame changes with the left hand while the right hand is free to make tracings of the images reflected




CONTROL PANEL AND CABLE SOCKETS (I)

Figure. 8.




ELECTRONIC CONTROL CIRCUIT (II)

Figure 9.

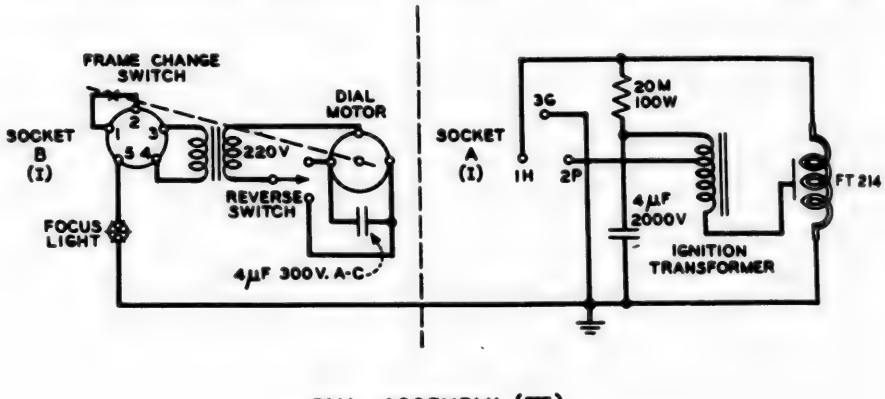



Figure 10.

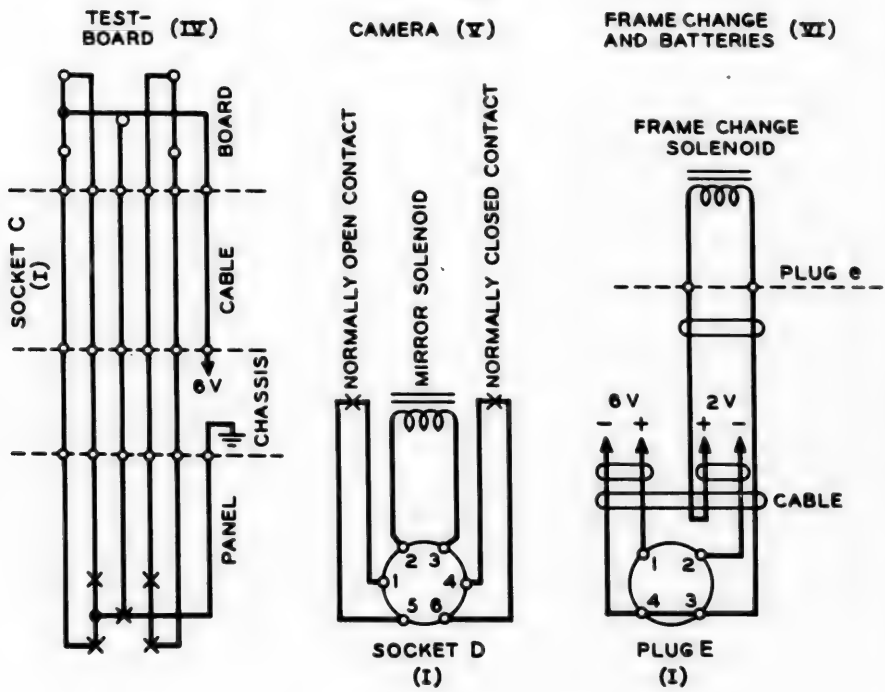



Figure 11.

by a surface mirror on the work table. It was found most practical to have the whole instrumental setting adjusted in such a way that the dial moves clockwise on the cornea when seen through the viewer of the camera, and the corresponding clockwise positions appear on the projected dial impressions. It thus becomes possible to observe and

analyze on the projected film the sequence of the dial positions as they appear on the cornea, and to follow the movements of the eye as indicated by the successive positions of the dial bar. In this way it is possible not only to study the eye-movements on individual frames but also to trace a composite record by the superimposition of several frames. The course of the eye-movements may also be superimposed upon pictures or other visual material which the subject may be asked to observe during the experiment.

## Results

The photographic technique with this camera makes it possible to obtain on any one frame a picture of the eye-movements that occur during one second or during multiples of one second. As has been said, during each second there are at least five exposures, and the apparatus in its present construction can be adjusted also to a larger number of exposures, up to 20 per second. In our studies thus far we have found the frequency of 10 per second to be the most practical rate. This rate avoids crowding of dial impressions, even if the movements of several seconds are registered on the same frame.

Figure 12 shows a photogram of dial impressions at 10 exposures per second. The successive dial positions are indicated by the spike-like impressions of the dial arm.

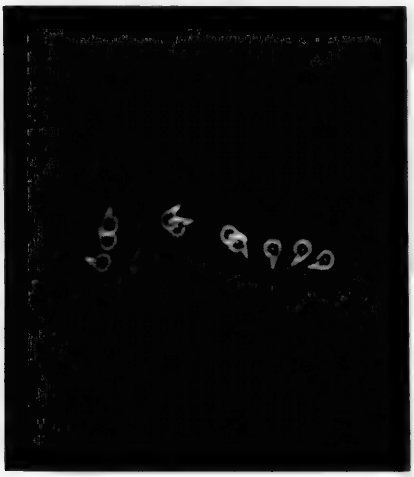


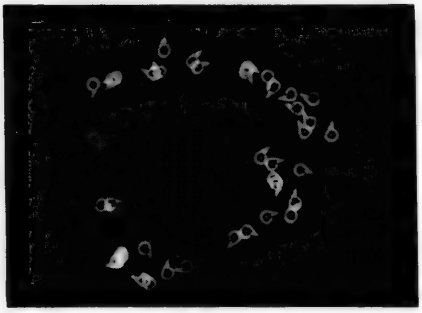
Figure 12. Photogram of eye-movements, ten exposures per second.

Figure 13 (A, B and C) gives photograms on which a rotating movement of the eye was recorded, the eye following a circle drawn on the board mounted on the camera. The frequency was 10 per second, and the one frame was presented during periods of two, three and four seconds. The presentation of individual frames during several seconds is especially useful where we deal with simple movements that do not overlap, thus avoiding the danger of crowding the dial impressions. Figure 13A in which the frame was presented for two seconds shows a number of fixations, indicated by the superimposition of several dial positions upon each other. In Figure 13C, where one frame was exposed for four seconds, some crowding and overlapping of a second rotation movement is observable.

This photographic technique was used for recording the eye-movements in the two attentional modes previously mentioned. We shall briefly report on three different experimental settings in which the behavior of the eyes was recorded both during periods of ditention and cotention:

A. Two seconds.

B. Three seconds.



C. Four seconds.

Figure 13. Photograms of rotation movements.

1. The subject was asked to focus upon the center of a circle placed on the board in front of him.

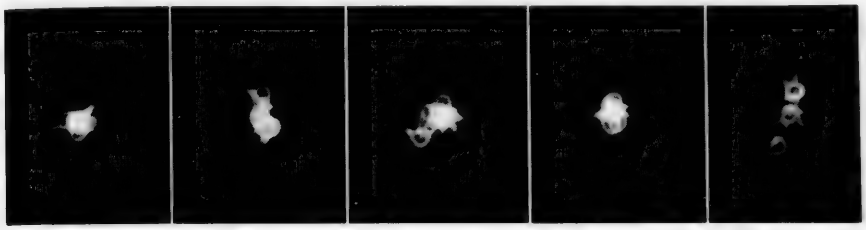
2. The subject was asked to look straight ahead in a relaxed manner, without forcing himself to focus upon any special point, but without getting too far away from the visual field directly in front of him.

3. The subject was asked to look at pictures placed in front of him.

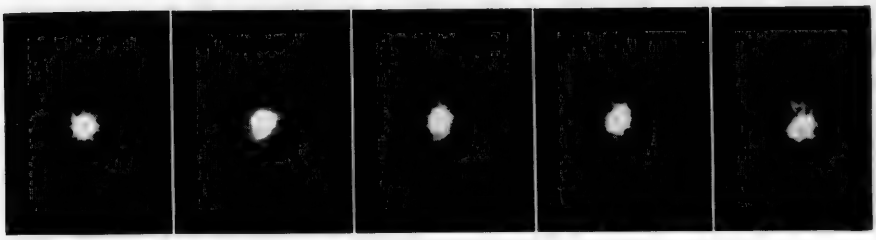
It was found that under all three experimental conditions there are fewer and less extensive eye-movements in cotention than in ditention. At the same time, the fixations are of longer duration in cotention. As one would expect, the movements are most restricted in both attentional modes when the subject focused upon the center of the circle in front of him (Figure 14, A and B). However, in this experimental setting the eyes were kept much more steady in cotention than in ditention. We find a similar difference in the experimental setting which the subject looked ahead in a relaxed manner (Figure 15, A and B). In ditention there are a considerable number of random movements, whereas the movements are less frequent and of lesser range in cotention. And again, the number and extent of the

eye-movements are very markedly reduced in cotention when the subject looks at pictures placed in front of him (Figure 16, A and B).

In order to make tests regarding other types of eye-movements, the subject was asked to follow clockwise a circle of 10 inches in diameter



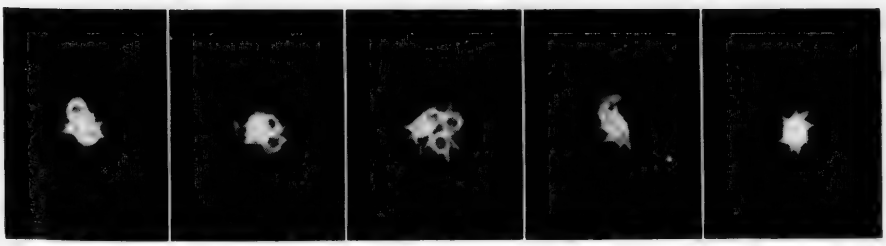
A. Ditention.



B. Cotention.

Figure 14. Photograms of five successive one-second periods when subject was focusing at center of circle.

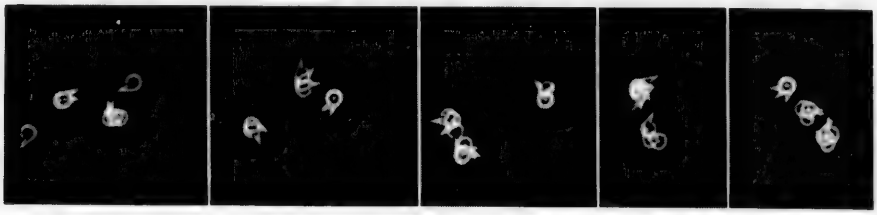
A. Ditention.



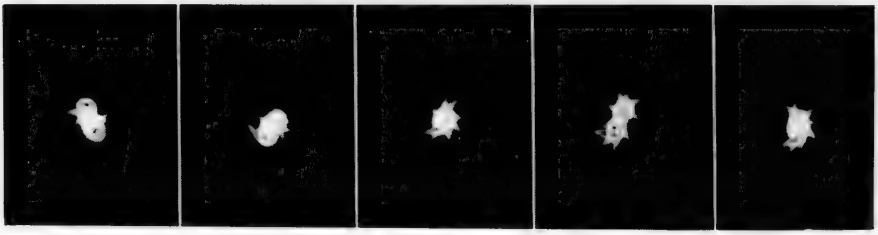
B. Cotention.

Figure 15. Photograms of five successive one-second periods when subject was looking ahead without focusing.

placed on the board in front of him (at a distance of about three feet). It was found that in order to obtain comparable material it was most practical to have the subject complete one rotation in two seconds. This could easily be done as the operation of the camera is accompanied by an audible click that occurs once per second. The frame change was actuated manually every two seconds, so that a complete rotation was recorded on each frame. The frequency of exposure varied from 8 to 15 per second. In each mode of attention the subject repeatedly per-



A. Ditention.



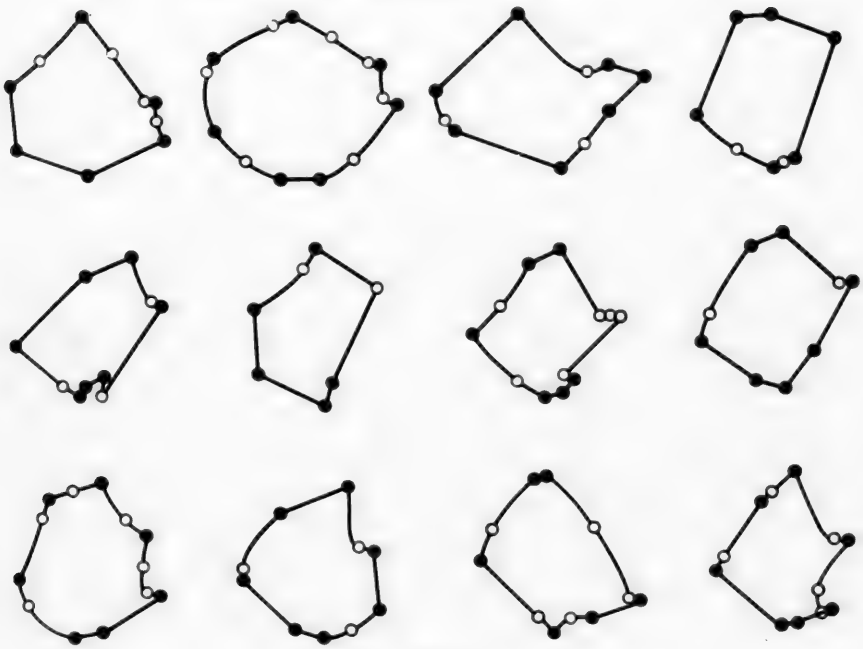
B. Cotention.

Figure 16. Photograms of five successive one-second periods when subject was looking at a picture.

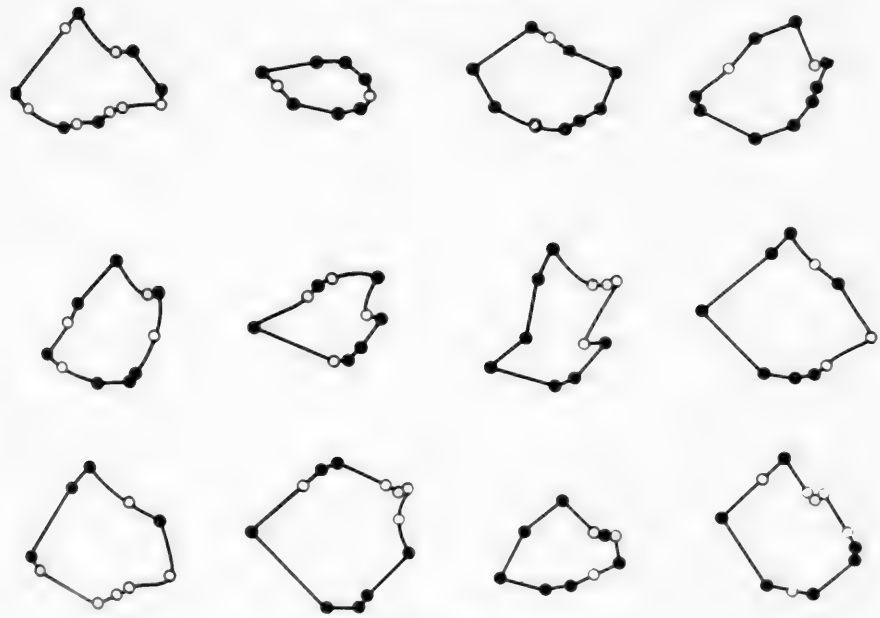
formed series of 15 or more rotations. The photographic records thus obtained were projected and the dial impressions transferred to paper. Lines connecting the dial impressions were added to indicate the actual course of the eye-movements. Figure 17 (A and B) presents drawings of a series of twelve successive rotations in ditention and cotention. Where two or more dial impressions were superimposed we have fixations, and we have indicated these pauses between the eye-movements by solid black circles. The open circles, on the other hand, indicate individual dial impressions which were obtained while the eye was moving.

In comparing several series of circles thus obtained, we found that on the whole the circles were smaller in cotention than in ditention and that there was an emphasis on the horizontal axis in cotention.

In these studies we came upon an accidental finding which will be mentioned briefly: When the subject looked successively at the four



A. Ditention.



B. Cotention.

Figure 17. Drawings of photograms of twelve successive two-second periods when subject was performing a rotation-movement.

points of reference located at the corners of a 10-inch square on the board, the recorded impressions did not form a square but an oblong figure which is shorter in the vertical than in the horizontal direction (Figure 18). This relative shortening of the vertical axis was present in all our subjects, but its extent differed slightly from person to person and also in different readings on the same person, even when these readings were taken during the same experimental session. We have not yet determined statistically the degree of variation or consistency in these deviations within individual subjects or groups. But in any case, it is important to know that the eye-movements as recorded do not correspond exactly to the actual spatial relations of the points looked at.

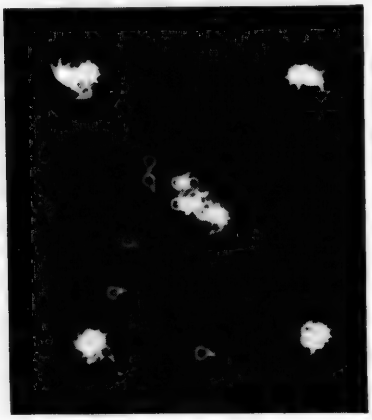


**Figure 18. Photogram of fixations when subject looked successively at the corners of a ten-inch square.**

This difference between vertical and horizontal movements may be explained in part by the circumstance that the vertical curvature of the cornea differs slightly from the horizontal. However, an actually smaller movement of the eye in the vertical direction should also be considered as a possible cause. The deviation is not of great importance where we are dealing with such aspects of the eye-movements as are here reported. It is more important, however, where there is the problem of superimposing the photographic record upon the material looked at. Because of individual variations, this deviation may not be adequately corrected by establishing the group average, but it may be necessary for purposes of correction to establish the average deviation of each individual subject.

*Summarizing,* we may say that the Lifwynn eye-movement camera makes it possible to record simultaneously the horizontal and vertical components of the eye-movements as registered on single frames during periods of one or several seconds. It permits obtaining an immediate impression of relatively large sections of the eye-movements. The corneal reflection is recorded in the form of a rotating dial so that the observer, by following the chronological sequence of the exposures, may trace the actual course of the eye-movements. Thus a quick and easy analysis is possible without calculations or other complicated procedures. This camera was employed by us to study the differences in the ocular behavior in different patterns of attention, or in different functional adjustments to the environment.

# A Variable Control X-Ray Illuminator and Copy Stand

**Albert Sadler****

THE equipment herein described is "home made", and has been in constant use for many years. It utilizes a simple idea which is used in some quality contact printers.

The criterion for satisfactory X-Ray transillumination is complete diffusion and homogeniousness of the light over the entire area of view. Were all radiographs of uniform contrast and density range, any view box that meets this criterion would be suitable for illumination for photo-copying. However, since radiographs differ widely in contrast and density range, the photographer must necessarily introduce control. The common method is dodging and burning in, either during the copying, or printing, or both.

The use of a black card with a hole in it and a black paddle on a wire is not, in my opinion, the total answer to dodging. The method is complicated and of insufficient accuracy. A simple, effective method is the control of the light source behind the film. Commercial X-Ray viewers do not lend themselves to this type of control because they utilize indirect illumination and/or have only two or four lamps. A multiple light source is needed.

The illuminator described here (Figure 1) consists of a plywood box approximately 31 inches high, 21 inches wide, and 17 inches deep, with an opening 18 inches by 16 inches in front. It is painted white inside. The back contains ventilation slots, 2 inches wide, at the top and bottom. A bank of thirty-five incandescent 15 watt lamps, symmetrically placed seven high and five wide in the back of the box, provides the illumination. These bulbs burn in the horizontal plane. Each bulb is controlled by its own switch. The panel of thirty-five toggle switches is set in the side of the box.

Two sheets of opal glass, one inch apart, are placed eight inches in front of the lamps, that is, the distance from the rear glass to the top of the lamps is eight inches. The front sheet of opal glass is two inches

* Received for publication February 28, 1949. Medical Photographer Wayne County General Hospital and Infirmary, Eloise, Michigan. Read before the 18th Annual BPA Convention, Philadelphia, Pennsylvania, September 8, 1948.

behind the plane of the film holder. At one side of the box is a door 28 inches by 3 inches to allow insertion and removal of both opal glass and lamps.

The lamps are wired in parallel (Figure 2). When one bulb is switched off, the others are unaffected. Control of illumination is effected by switching off the lights behind thin areas of the film. In order to reduce effectively the illumination of any given area of the film, it is necessary to extinguish a block of lamps; the difference of one or two lamps is not noticeable. With the reduction of the illumination behind an area or areas of the radiograph, the illumination is relatively increased in the rest of the film.

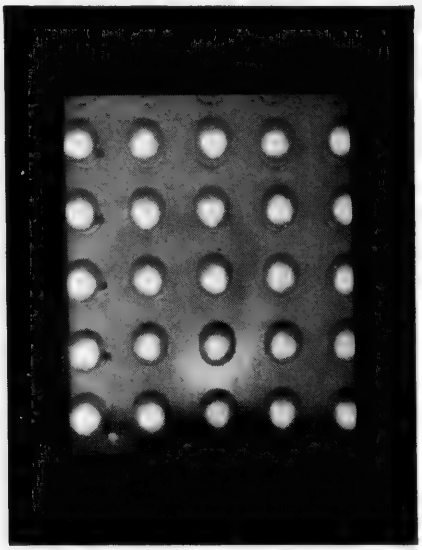


**Figure 1. Interior view of the illuminator box showing position of the lamps.**

A great advantage of this type of control is the fact that the photographer can see the effect of the control before he takes the picture; whereas with other types of control he can only guess what the result will be. Furthermore, the use of a photo-electric exposure meter to measure the illumination is available. This provides a means of balancing the densities of the negatives of a series of X-Ray films having unequal densities. At the same time, the determination of exposure is simple once a standard has been set. (Hold the exposure about one foot from the film.)

More important, however, is the use of the exposure meter to find the density range of the radiograph. This range should come within the straight line portion of the H and D curve of the copy film emulsion. If the range is too wide for the film, it should be reduced by switching off the lamps behind the clear area of the radiograph. (Hold the exposure meter in contact with the x-ray film.) The radiographs are held in frames made with slots to accept standard sizes of film, one frame for each size. These frames fit into the front opening of the box, and are held in place by winged catches. A masking device such as is used on contact printers would serve equally well. This would require a piece of clear glass to be inserted in the front opening to support the

film. No light must be visible along the edges of the illuminated radiograph.

The illuminating box (Figure 3) stands on a table 37 inches high, 17 inches wide, and 23 inches deep. Several vertical shelves are built into the space between the front and rear legs to hold the masking frames.

The table is made from the design of an optical bench. It is 60 inches long, 15 inches wide, and 36 inches high. The top consists of two boards slotted on the inside the entire length. The camera support (Figure 4)

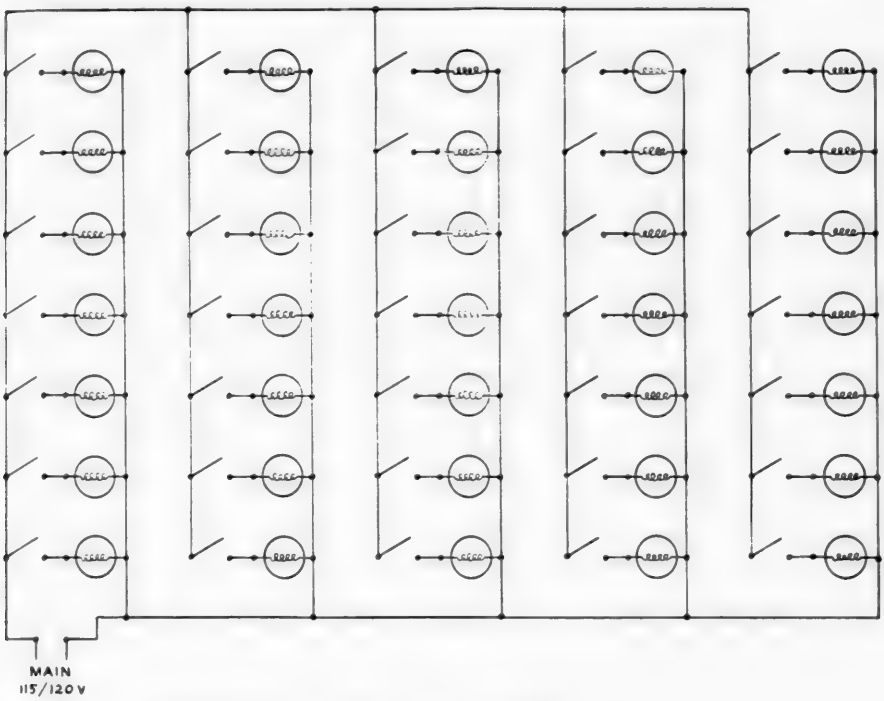



**Figure 2. Schematic wiring diagram for the lamps and switches.**

comprises a T design whereby the top piece moves side to side; the upright moves up and down, and both move back and forth in the slots as a unit.

Rigidity and position are maintained by friction obtained with locking screws. The locking devices are as follows: for forward-backward travel, a wooden bar grips the underside of the bench top. This bar is

bolted to the piece which rides between the slots. For up and down travel, the square upright of the T slides within a square tunnel built into the center of the piece between the bench top slots. It is locked by means of a steel pressure plate in conjunction with a wheeled bolt. For cross travel, the top of the T (Figure 4) has flanges on both under sides, with inside grooves. These fit into similar pieces across the upright. Four bolts fastened to small rectangular steel pressure plates, with winged lock nuts, hold the cross piece rigid.

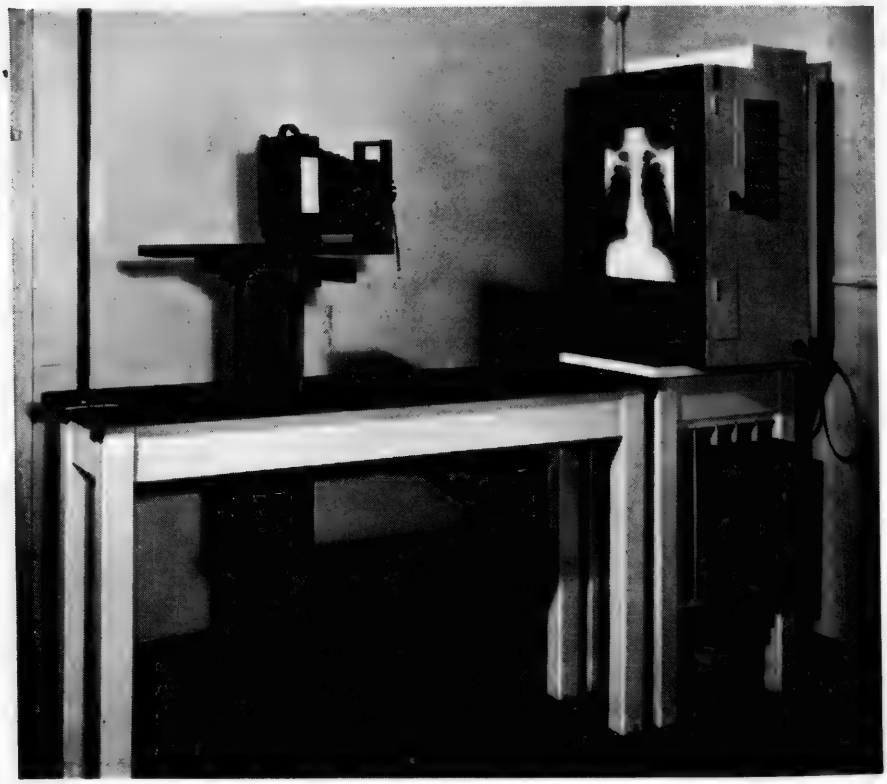


**Figure 3. Complete assembly of table, camera support, illuminator support and illuminating box.**

Since this copy unit was made, several improvements have come to mind; they should be incorporated in the construction of a new unit.

The distance between the lamps and the opal glass should be reduced. One or possibly two rows of lamps could be eliminated to make a bank

of thirty (five across by six high) or twenty-five (five square). The bank should be recentered of course. Quite probably 16 lamps could be used effectively.

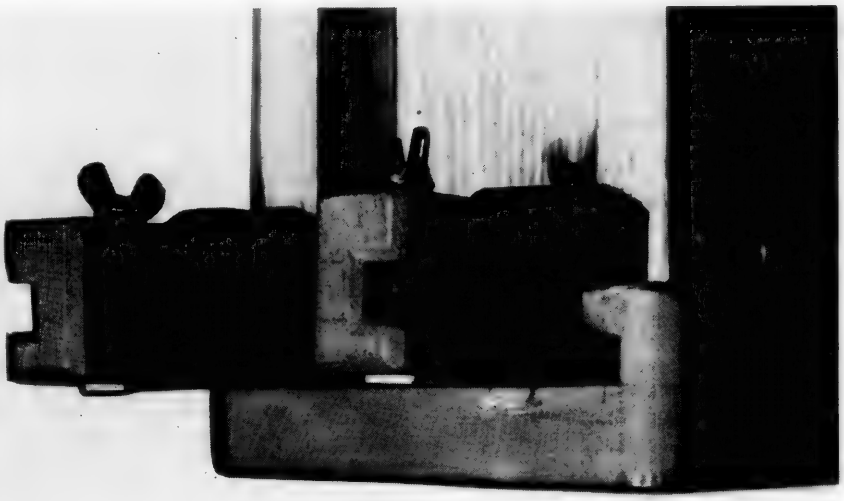


Figure 4. T design of the camera support showing the locking device.

The device for raising and lowering the camera T support does not work too well in very damp weather because of swelling of the wood. A rack and pinion with worm gear would permit smooth, effortless movement at all times. These parts could well be obtained from an old piano stool or heavy studio tripod.

The frames for holding the trays are generally suitable, but now and then a film has to be trimmed to fit. Moreover, if the film lies below the tip edge of the frame, it will curl in toward the opal glass because of the warmth of the lamps.

The use of thin metal masks would eliminate these inconveniences, and would also be especially useful where only a portion of the film has to be copied.

In view of the possible improvements, no plans for construction are given here. Anyone interested in this unit should experience no trouble in having a carpenter and electrician build one.

* Discussion by C. GRAHAM EDDY, Veterans Administration, Washington, D.C.

Most instruments are the result of attempts to satisfy special needs. Such was the case with this X-ray illuminator. In this instance the need was to combine necessary exposure controls with shorter total exposure times. The ultimate aim was to reduce both the labor and the time required to make intermediate negatives of radiographs.

It was hoped that multiple light sources could be placed behind a radiograph in such a manner than an uneven pattern of light roughly corresponding to the density pattern of the radiograph would result and furthermore, that this illumination pattern could be quickly altered by the photographer in order to adapt it to successive radiographs placed in front of it for copying. Ideally, no manual dodging during exposure would be necessary with such an arrangement. The instrument described by Mr. Sadler is a workable compromise. Perhaps it would have been more fortunate if the result has been less successful, for probably the equipment would then have been re-built and some of the existing faults eliminated. Fear of "hot spots" influenced the arrangement of lights and diffusers with resulting overcompensation and less control than was anticipated. There is too much diffusion.

As the equipment now stands, groups of three or four adjacent lamps must be turned off or on to produce any appreciable effect. This fault can be partially corrected without changing the design of the illuminator by using only one of the opal glass diffusers or by using brighter lamps. Lamps made of clear glass (such as those used in electric signs) may prove more satisfactory than the familiar inside frosted type. Should the equipment be redesigned, the number of lamps should be decreased to about 20. Also the distance between the lamps and the diffusers and the distance between the diffusers and the radiograph should be shortened. There will be times when evenly diffused homogenious illumination is required and it may be necessary to retain both diffusing glasses for that purpose.

On the credit side, it should be pointed out that this equipment does lighten the work of making good copies of radiographs. By varying the light pattern behind the radiographs to be copied, their effective density ratios can be sufficiently altered to bring them reasonably close to the density range encompassed by the characteristic curve of the copying film emulsion. Some dodging during exposure will usually be necessary, but it will be simplified and reduced to a minimum. Although this illuminator has a number of obvious faults, it has reasonably fulfilled its function of satisfying the special need for which it was built. During the ten years which it has been in operation, it has amply justified its existence in terms of time and temper saved.

# New Typewriter Speeds Up Preparation of Material for Making Lantern Slides

**Robert D. Wolf, Photographer** *

IN preparing lantern slides the new electric typewriter with proportional spacing manufactured by International Business Machines will produce legibility far superior to the type afforded by an ordinary typewriter. This type is slightly larger than pica and requires about 15% less space, thereby permitting the inclusion of more material per slide.

Spacing in an ordinary typewriter is the same for each character. In the proportional spacing machine, each character selects its proportionate amount of space from the spacing mechanism. The characters require from two to five units of space, a unit being 1/32 of an inch in width; the small "1" requires two units while the capital "L" requires four units.

Spacing between words can be varied from one to four units. This mechanism allows the proportional spacing typewriter to produce work which is comparable to type-set work.

In the preparation of our lantern slide this new machine has replaced both the ordinary typewriter and the LeRoy Lettering Set.[1] A method of producing lantern slides of kymographic records by those two methods was described in the December 1948 issue of The Journal of the Biological Photographic Association.

We are now able to produce slides using the IBM Proportional Spacing Typewriter which are as good, if not better than those prepared with the LeRoy Lettering Set and yet save hours of time.

While the IBM is no time saver in comparison to the ordinary type-

* Ciba Pharmaceutical Products, Inc., Summit, New Jersey.

[1] Made by Keuffel and Esser Company, New York, N.Y.

writer, its advantage here lies in the fact that the final result is a copy equal in appearance to the best type-set work.

Figure 1 is an example of the IBM type used on a kymographic record.

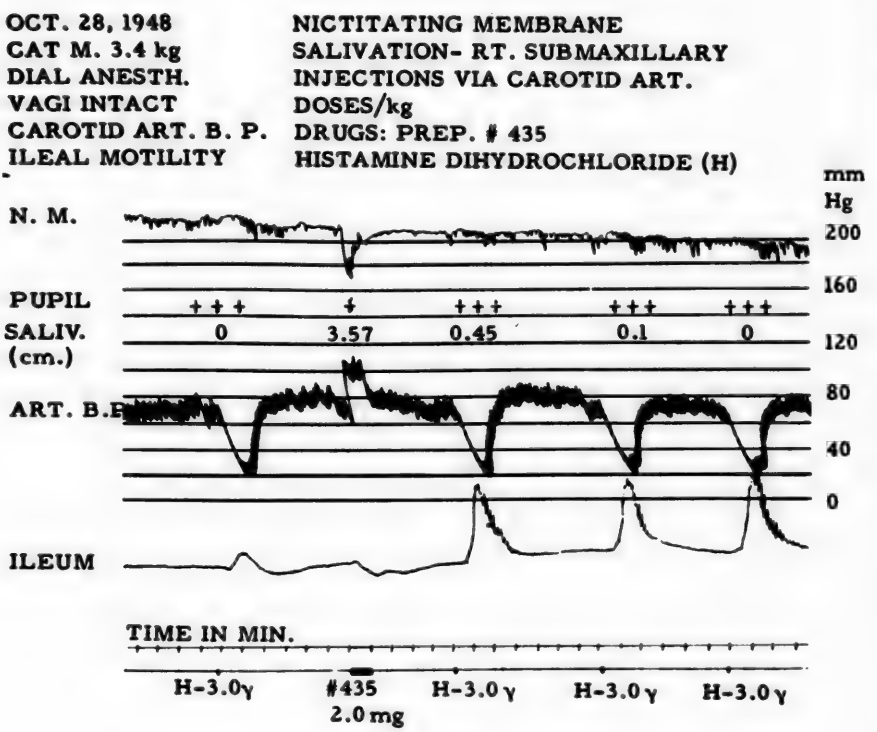



Figure 1.

---

## Information on Fellowships

Members may propose for the Fellowship in the Biological Photographic Association other members whom they consider worthy of recognition. Two sponsors are required. Information concerning the procedure and requirements may be obtained from the Secretary, Miss Anne Shiras, University Office, Magee Hospital, Pittsburgh 13, Pa.

# *Preliminary Program*

## Nineteenth Annual Convention — Biological Photographic Association — Cleveland, Ohio, September 7-10, 1949.

### WEDNESDAY, SEPTEMBER 7th

8:30 Registration
10:00 Call to Order. Dr. Edmond J. Farris, President.
10:10 Welcome. David Lubin, Convention Chairman.
10:20 Scientific Film Program of National Film Board of Canada. Roger J. Ross, Technical Research Department, National Film Board, Ottawa.
10:50 Progress Report, President Farris.
11:00 Business Meeting.
12:00 Official Opening of the Exhibits.
12:30 Luncheon
(Speaker to be announced)
2:00 Motion Picture Symposium—Production Techniques. Warren Sturgis, Chairman, Sturgis-Grant Productions, Inc, New York City.
4:30 Exhibits.
7:00 Motion Pictures
Vegetable Insects. Rodger J. Ross, National Film Board, Canada.
The Circulation in the Fetus and in the Newborn.
Warren Sturgis
The Rehabilitation of Laryngectomized Patients. Sturgis-Grant Productions, New York City.
Warren Sturgis
Elementary Technique in Bacteriology. Russell E. Culbertson, Dental School, University of Oregon, Portland, Oregon.
9:00 Smoker. Courtesy of E. I. du Pont de Nemours & Co. Photo Products Department.

### THURSDAY, SEPTEMBER 8th

9:00 Demonstration of the Kodak Flexichrome Process. H. Lou Gibson, Medical Division, Eastman Kodak Co., Rochester, N.Y.
10:00 A Mechanical Memory—Photographic Applications of Punched Cards. Thomas T. Hill, The Edwal Laboratories, Inc., Chicago, Ill.
10:30 Simplified Method of Classifying and Indexing Visual Education and Research Material. Margaret Schell, 536 West Arlington Place, Chicago, Ill.
11:00 Motion Picture—Spermatozoa of Vertebrates. Edmond J. Farris, Wistar Institute, Philadelphia, Pa.
12:00 To Nela Park.
1:00 Arrival Lighting Institute

1:15 Lunch in Cafeteria
2:15 Auditorium. Photographic Laboratory Facilities at Nela Park. F. E. Carlson.
Photomicrography with the FT-230 Flash Tube. O. W. Richards.
Introduction to Nela Park and the G-E Lighting Institute. F. O. Maltby, Jr.
3:00 Tour of Lighting Institute
4:15 Auditorium. New Horizons of Lamp Research. Alston Rodgers.
5:00 Return to Hotel.
*Evening free for exploration of Cleveland or what you will.*

## FRIDAY, SEPTEMBER 9th

9:00 Symposium—Jobs, Training, and Placement. C. Graham Eddy, Chairman, Medical Illustration Division, Veterans Administration, Washington, D.C.
11:00 Photographic aspect of fundus pictures, Jerome A. Gans, M.D., Cleveland, Ohio.
11:30 Microscopy of sulfonamids. Charles Maresh, American Cynamid Co., Calco Division, Bound Brook, N.J.
12:00 Reflection. Edward M. Gunn, M.D. Chief, Army Medical Illustration Service.
12:30 Election of Officers.
Visit the Exhibits
2:00 Photomicrography with the G.E. FT-230 Flash Tube. Ralph Buchsbaum and Karl H. Norris, Institute of Radiology and Biophysics, The University of Chicago, Chicago, Ill.
4:30 Exhibits
6:00 Kodak Cocktail Party
7:00 Honors Award Dinner.
Photography as an Aid to Science. Dr. Otto Glasser, Biophysics Department, Cleveland Clinic Foundation, Cleveland, Ohio.

## SATURDAY, SEPTEMBER 10th

9:15 Let's Look at it in a New Light. Herbert W. Holmes, Chief Photographer, Department of National Health and Welfare, Ottawa, Canada.
10:00 The Knebel Clinical Camera. Robert W. Knebel, 2711 Monroe Ave., Rochester, N.Y.
10:30 Problems Affecting the Quality of Lantern Slide Reproductions of Radiographs. Wm. L. M. Martinsen, Wadsworth General Hospital, Veterans Administration, Los Angeles, Calif.
11:00 Corrective Photography. Lewis L. Kellsey, 78 West Englewood Ave., Englewood, N.J.

*Note: Half hour assignments include 20 minutes for the paper and 10 minutes for discussion.*

# Exhibits for the Scientific Photographer

The BPA Annual Salon, open specifically to the biological photographer, will be held at the Hotel Cleveland, September 7-10. The closing date for entries is August 15, and blanks were mailed to our members this spring. Two other Salons with later closing dates are also open to the scientific photographer, as follows:

*The Photographic Society of America* invites photographers to submit black-&-white or color transparencies to their Fifth Open Technical Exhibit. Subject matter may include any phase of technical photography except pictorial photographs of technical and mechanical operations. There is no limit to the number of prints a contributor may submit; and no entry fee is required.

Each print or series of prints should be mounted on one or more 16 x 20 in. cards if possible, or on 20 x 24 in. cards if necessary. Each entry should be accompanied by a short description of the equipment and methods used to obtain the photographs and by explanatory comments regarding the interpretation and significance of the pictures. The comments supplied should be sufficiently complete to enable those viewing the exhibit to appreciate the usefulness of the photographs. If possible, these technical data and comments should be placed in the lower left-hand corner of the mount, or on a separate card. If necessary they may be given in a letter and sent separately to the Technical Exhibit Committee.

The contributor's name and address should appear on the back of each mount. The maker's name should appear on the face of the mount.

Closing date for entries is September 3, 1949. Entries or requests for further information should be sent to Mr. W. F. Swann, 343 State Street, Rochester 4, N.Y.

Entries chosen by a panel of three judges will be exhibited October 17 to November 1 at the City Art Museum at St. Louis, Mo., in connection with the 1949 National PSA Convention. With the entrant's consent they may also be included in a traveling show touring the country following the St. Louis exhibit. Each exhibitor will receive an illustrated catalog of the exhibition.

The *Scientific Monthly*, in cooperation with the Smithsonian Institute, will sponsor the third International Photography-in-Science Salon, a competition to encourage and extend the use of photography as a basic research tool. Entries will be received by the editor of the *Scientific*

*Monthly,* 1515 Massachusetts Avenue, N.W., Washington 5, D.C., from August 24 to September 14, 1949.

First, second and third awards and five honorable mentions will be given for the photographs judged to be best in the black-&-white and color sections of the Salon. Specialists in science and photography who will serve as the judging committee will consider the initiative, originality and results obtained more than the composition and pictorial quality. All photographs must be taken for scientific purposes.

The prints selected for awards and display will be shown at the U.S. National Museum during October 1949 and at the New York meeting of the AAAS in December. They will then go on tour of scientific centers here and abroad.

## B.P.A. Facts and Figures

As of June 1949, the sectional distribution of our membership was as follows:

| | |
|---|---|
| Northeastern section of the U.S. | 53% |
| Central section | 20% |
| Southern section | 8% |
| Western section | 12% |
| Canada | 3% |
| Other countries | 3% |

By occupation the distribution was:

| | |
|---|---|
| Full-time professional photographers in medicine or dentistry | 32% |
| Full-time professional photographers in other biological sciences | 1% |
| University Photographers (whose departments serve a whole institution) | 1% |
| Technicians and Part-time photographers | 5% |
| Commercial members (including part-time scientific, free-lance, designers, dealers) | 12% |
| M.D.'s and Dentists | 32% |
| Scientists in other biological fields | 11% |
| Directors of Visual Education Projects | 1% |
| Miscellaneous and Unclassified | 5% |

Eleven of our members are M.D.'s or Ph.D.'s who list photography or the administration of photographic departments as at least a part

of their regular duties. Four of these eleven give photography as their full-time work. And, as in June 1948 when we published our last report on statistics (Vol. 16, No. 4, p. 177) 10% of our members are women.

## News of Our Members

In the North American Veterinarian for December 1948, Vol. 29: No. 12 is an article "Bovine Sterility: Case History" by Ray H. Bradbury, D.V.M. It discusses six apparently normal cows which nevertheless did not conceive readily and so were slaughtered. Autopsies revealed endometritis or indurated tubes. The article relies mainly on photographs of the ovaries and uterus of each cow, and two photomicrographs; the textual part being very brief. The author states that the material presented is not complete but may be stimulating for further study of the bovine sterility syndrome. "These are," he states, "merely the observations of a general practitioner recorded through the lens of his camera." Dr. Bradbury joined the BPA in 1948.

Dr. Edmund J. Farris, President of the BPA, received the Fourth Annual Award of the American Urological Association for "the most outstanding work in human male sterility" on May 19, 1949, in Los Angeles. The award consists of $1,000 and a scroll.

One of the conditions for receiving the award is that the recipient must present an address before the Society at its assembled meeting, and so on the afternoon of May 19 Dr. Farris addressed the Society on the "Evaluation of Sterility Problems in the Human Male." That evening he gave the same address at the meeting of the Southern California Chapter of the BPA; and on May 24 before the San Diego Academy of Medicine.

A color-slide of a mineral subject "Malachite" entered by Jay T. Fox, BPA, in the Third Michigan International Exhibit of Nature Photography received the first-prize ribbon from the Michigan Mineralogical Society as well as stickers from the Detroit Flower Show and the Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Dr. Peter Hansell M.R.C.S., L.R.C.P., has organized a Medical Illustration Department for the Institute of Ophthalmology, London. England. He has undertaken this work in addition to his duties as Director of Medical Photography at the Westminster Hospital, London.

An illustrated page from the Chicago Daily Tribune for May 5, 1949 offers a fairly complete survey of the duties of a medical photographer. It is headed "Movies Help the Stritch School of Medicine Prepare Students for Role of Physician or Surgeon" and shows our member Charles Lindsay shooting over the surgeon's shoulder in one of those time-honored operating-room shots reporters like so well. In addition to this featured shot, however, are photographs of Mr. Lindsay taking two clinical pictures, a gross specimen, an X-Ray copy and a photomicrograph. Here is at least one story that shows there are other sides to a medical photographer's life than donning cap and mask and making spectacular records in the O.R.

Ray J. Maas, BPA, Photographer at the University of Rochester, N.Y. has given a practical course in general photography at the University this past year, including negative-making, copying, enlarging, photomicrography, lantern slide making, etc., with special emphasis on the application of photographic methods to the class-room and lecture-hall, and for material to be presented

for publication. The course was available to graduate students in the division of biological sciences who have had college chemistry and physics, but no training in the field of photography. Projects were assigned throughout the course, giving the students their choice, wherever possible, of subjects which fitted their special interests and requirements. Included was one period under the direction of the staff artist on the use of lettering guides and other illustration materials.

Our readers may have noticed the fine color-picture of a Cedar Waxwing feeding her young in the nest, and other bird shots used by the Eastman Company in a recent advertisement for Kodachrome. The pictures were made by our member Eliot F. Porter who received a Guggenheim Fellowship for work on bird photography and who has since been working on ornithological pictures in and around Santa Fe. This summer he is on Great Spruce Head Island, Sunset, Maine, photographing more birds. He has started experimenting with a special power pack for stroboscopic light which delivers about as much light as two #22 flash lamps, and hopes to make extensive use of this light-source next winter.

Charles G. Reiner, formerly photographer at the Highland Hospital, Rochester, N.Y. has taken a position with John Beiter in the Department of Photography, Rochester General Hospital, N.Y.

Albert Sadler, FBPA, has published an article on "Amateur Photomicrography" in the Photographic Society of America Journal, April 1949, Vol. 15: No. 4. The author states in a forword that the best first investment for the beginner is a good handbook since only a book can cover the subject adequately. He adds that the purpose of his article is to outline the various factors so that the prospective photomicrographer knows what to expect. References to fuller works are given.

Barbara White, BPA, who received training in medical photography at the Rochester General Hospital, N.Y. has taken a position as an assistant photographer to C. A. Pickard, BPA, Wayne College of Medicine, Detroit, Michigan.

Two new chapters have been organized in the past winter. New York, which had not had a chapter since 1939, re-formed an active group, and a West Virginia chapter was started. An outline of chapter activities is given here in the belief that our members will be interested in the topics presented on the various programs.

*Boston Chapter.* Notices of the following programs were received from the Secretary, Mr. Laurence Brown of the Harvard School of Dental Medicine:

"The Use and Misuse of Animated Films in Teaching," by Dr. Charles Hutter, Orthopedic Service at the Massachusetts General Hospital, formerly Technical Advisor on Medical Films with Walt Disney Productions.

"The Norwood Meter." A talk and demonstration by Leonard Danskin of Lever Bros. Also a "Kodachrome Travelogue" by Mark McCann, Massachusetts General.

Trip to the Chelsea Naval Hospital Photo Lab. Talk by Com. Fraser (M.C.) U.S.N. on "The Attitude of Physicians and Radiologists to Medical Photography." Also a film on "Archery."

Kodachrome Film "Extraperitoneal Caesarian Section" followed by an informal demonstration of the technique of filming this same picture by Leo Goodman, photographer at the Boston City Hospital, where the meeting was held.

"Operation Crossroads, the A-Bomb Test at Bikini" and "The Fleet that Came to Stay, the Task Force to Okinawa," two motion picture films shown at the Massachusetts Memorial Hospital through the courtesy of Com. Fraser, Chelsea Naval Hospital.

Trip to Beth Israel Hospital, Paul Showstack, host. Demonstration of the Coreco-Bucky Clinical Camera, and a Kodachrome film "Battling Bluefins."

"Kodachrome and Ektachrome" Howard C. Coulton, Eastman Kodak Co.

This chapter meets informally in the laboratories of its various members, Ferdinand Harding acting as *Chairman.* Refreshments are usually served. In the past year Paul Showstack and Mark McCann conducted a survey with a view to increasing the membership. The chapter hopes to grow in the coming season and to find a permanent meeting place.

*Chicago Chapter.* The Secretary, Miss Lorraine Genovese, of the Department of Neurology and Neurological Surgery, University of Illinois, has sent notices of the following meetings:

"Methods of Finding Information," Thomas Hill, Edwal Laboratories, Inc. "Spring-time in Yosemite Park," Avis Gregersen, University of Southern California.

"Illumination in Photomicrography" Wolfgang Zieler, Manager of the Scientific Instruments Division of Debs Hospital Supply Co., Chicago. Also, "Color results in Reciprocity Failure of Ansco Color Film," Jean Crunelle, University of Chicago.

Annual Christmas Meeting. "Punch" and dinner at the Illini Union Building. "Common Birds in Our Garden in Color and Motion," Davies Lazaar, D.D.S., Winnetka, Ill.

"You Can See the Ear Hear, Function of the Ear in Health and Disease," Heinrich G. Kobrak, M.D., University of Chicago, where the meeting was held.

"Demonstration of the Electron Microscope" by Dr. Carlos Reed, University of Illinois. Election of Officers at which the following officers were elected: *President,* Jean Crunelle; *Vice-President,* Ralph Creer; *Secretary,* Lorraine Genovese; *Treasurer,* Maria Ikenberg; *Directors,* Don Burge, Inez Frischkorn, John Bayalis, (ex-officio) Dr. T. Benedek.

"From Photograph or Drawing to Printed Page," Theodore Noel, R. R. Donnelly Co. Joint meeting with Association of Medical Illustrators.

Demonstration of "Larjachrome," Miss Jane Glaser, Argonne National Lab.

"Demonstration of Three-Dimensional Color Projection" by Mrs. Maria Ikenberg, University of Illinois. Also "Constructive Criticism and Comment on Your Motion Pictures," by the group headed by Ralph Creer of the Committee on Medical Motion Pictures, American Medical Association.

General Discussion of Photographic Prints and Lantern Slides, based on prints and slides brought by members. And "Forum on What the Medical Photographer Should Charge for His Work."

The Chicago Chapter meetings are preceded by a dinner, usually held at the Professional Y.M.C.A.

*New York Chapter.* At the organizational meeting held on December 8, 1948, Mrs. Margaret Frankow was chosen Secretary of the temporary committee. She has sent the following program notices:

"Speedlamps in Photography of Patients," Percy Brooks, Cornell University Medical College, Dr. E. J. Farris, National BPA President, attended this meeting to extend his greetings and best wishes to the Chapter.

Symposium on "Close-Up Photography," Moderator, Lester Bergman of Bergman Associates. During this discussion a motion picture showing experimental work with the Zoomar lens was projected; and a number of slides illustrating special equipment and methods were shown. Later a motion picture on saddle-back block anesthesia was shown and a questionnaire for judging the motion picture was given to each member present.

"Cinephotomicrography," C. G. Grant, New York University. Further Discussion of Close-up Photography.

"Practical Applications of Photomicrography," R. F. Smith, Brookhaven National Laboratories; and "Ernst Abbe," Dr. Hans Freivogal. Moderator, C. A. Brinkman, Gamma Instrument Co. Discussion of color-slides submitted by members.

"Motion Pictures in Medicine," Warren Sturgis, Sturgis-Grant Productions, Inc. Elections were held at which the following Executive Committee was elected: Dr. Greydon Boyd, C. A. Brinkman, Percy Brooks, Julian Carlile, Mrs. Margaret Frankow (Secretary), Sidney Shapiro.

The June meeting was a picnic held at Tibbetts Brook Park from 11 A.M. until closing-time.

*Northern Ohio Chapter.* The Secretary-Treasurer, David Lubin of the Crile General Hospital, has sent copies of the minutes of the following meetings:

The first three meetings were devoted to informal discussions of work submitted by members and to making plans for the national meeting. The following officers were elected at the December meetings: *Chairman,* Thomas Lannon; *Vice-Chairman,* William Stevenson; *Secretary-Treasurer,* David Lubin.

"Three on One 35 mm. Camera," studies in anthropology with a special camera for research in measurement and mass study of the human physique by Dr. DuPertuis, Western Reserve University. This meeting was held at the Lightning Lite Co., with L. Earle Deane as host.

"Black and White Only," a discussion of slides submitted by members with all color slides barred.

Discussion of Infra Red and Ultra Violet Photography, illustrated by work submitted by members.

"Division of Patent Ductus Arteriosus" and "Coarctation of the Aorta," motion pictures made for Dr. John C. Jones of the Cleveland Clinic by Billy Burke Productions. Discussion of plans for the national meeting.

Salon Evening. Members were asked to bring prints to be submitted to the annual BPA National Salon, for appraisal and criticism.

"The Medical Motion Picture—Its Development and Present Application," a sound and color movie by courtesy of the American Medical Association.

The headquarters of this chapter has been the Cleveland Clinic, but meetings have been held in the laboratories of various members in other institutions.

*Southern California Chapter.* We are indebted to Avis Gregersen, Secretary for the following report of the chapter meetings:

"Pasteur's Legacy," motion picture. Also demonstration of the Coreco Camera by Arthur Hurt, Jr.

Demonstration and discussion of Ansco Film.

"Camouflage of Nature" and "Butterfly Botanists," two motion pictures by Cornet. Also, report on BPA National Meeting by Avis Gregersen and William Martinsen.

"Effect of Color Temperature on Color Photography," Frank Crandell, California Institute of Technology. National BPA Salon on display.

Symposium on Photomicrography: "Alignment," H. D. Greenwood, Braun Corporation. "Illuminance," James Smith, South Pasadena. "Exposure," Lloyd Matlovsky, County Hospital, U.S.C.

"Continuous Follow-Focus-Viewing in Cinemaphotography of Insects," Dr. T. W. Roberts, University of Southern California, with demonstration of especially designed equipment. Also "Reflex Finders for 16mm. Cameras," Paul A. Roos, Oliver Engineering Co. and "Ants," color movie in sound by Warwick Tomkins.

"Planning a Medical Exhibit," Lucille Cassell Innes, medical artist. Several exhibits were on display.

Round-Table Discussion on the "Photography of Wild Flowers," conducted by Walter A. Keith.

"Motile Spermatozoa as an Index of Fertility," motion picture presented by Dr. E. J. Farris, National BPA President, in illustration of his talk on "Evaluation of the Sterility Problems in the Human Male."

Demonstration of the "Intraflex Camera," by Arthur Neyhart, Guild Labs, L.A. This is a camera especially designed for the photography of body-cavities. Also "Function of the Ear in Health and Disease," 16mm. sound film by Dr. H. G. Kobrak, University of Chicago.

At the last meeting of the year the following officers were elected for 1949-50: *President,* George Brauer; *Vice-President and Program Chairman,* Dale Gillette; *Treasurer,* William Sokol; *Secretary,* Avis Gregersen. *Program Committee* to assist Mr. Gillette, Edward Hamilton and Lloyd Matlovsky; *Membership Committee* to assist Miss Gregersen, William Martinsen .

*West Virginia Chapter.* Notices of a plan to organize a West Virginia Chapter were sent to hospitals, high-schools and medical schools in West Virginia by Richard Crawford, photographer at the Myers Clinic, Philippi. Twenty-six persons replied requesting membership in the chapter; ten of these attended a meeting which was held in conjunction with the meeting of the West Virginia Academy of Science at Davis and Elkins College, Elkins, W. Va., April 29th and 30th. At this meeting the chapter adopted a constitution drafted by Dr. E. E. Myers of the Myers Clinic, and Mr. Crawford, using as models the constitutions of the West Virginia Academy of Science and of the Southern California Chapter of the BPA. The chapter requested and received affiliation with the West Virginia Academy of Science. The following officers were elected: *President,* Richard Crawford; *Vice-President,* Prof. Byron J. Turner; *Secretary-Treasurer,* Harvey E. Sturm, Jr.

## BPA Local Chapter Secretaries

| | |
|---|---|
| Boston | Laurence B. Brown<br>Harvard Dental School<br>188 Longwood Avenue<br>Boston 15, Mass. |
| Chicago | Lorraine Genovese<br>1062 W. Taylor Street<br>Chicago 7, Ill. |
| Northern Ohio | David Lubin<br>130 Keats Lane<br>Berea, Ohio |
| Southern California | Avis Gregersen<br>Department of Dermatology<br>Southern California School of Medicine<br>Los Angeles 33, Calif. |
| New York | Mrs. Margaret S. Frankow<br>Department of Dermatology<br>College of Physicians & Surgeons<br>630 W. 168th St.<br>New York 32, N.Y. |
| West Virginia | Harvey Earl Sturm<br>209 Maple Avenue<br>Philippi, W. Va. |

### Key Available to BPA Members of 5 Years Standing

A gold key, official emblem of the BPA, is available to those who have been members of the BPA for five or more continuous years. The emblem features a camera and a microscope, with a design resembling motion picture film along the two sides of the key.

It may be ordered from the L. S. Balfour Co., 1601 Chestnut Street, Philadelphia 3, Pa. for $8.75 plus 20% Federal Tax and any State tax in force in the member's locality. The above price includes the machin-engraving on the back of the key of the member's name (two initials and the last name) and date of joining the BPA. Additional data, such as the initials FBPA, date of receiving Fellowship, charter membership, etc., may be ordered for 2¢ per machine-engraved letter or numeral.

A pin, and safety catch can be applied when requested, at an added cost of $1.00 (subject to above taxes).

A jewelled version of this emblem will be given to each winner of the BPA Annual Award. Leo Massopust, FBPA, School of Medicine, Marquette University, Milwaukee 3, Wis., is the first recipient of the jewelled key.

# Sustaining Members

Dr. S. Glidden Baldwin
139 Vermilion Street
Danville, Illinois

Dr. E. C. Baker
Youngstown Hospital
Youngstown, Ohio

Dr. Dennistoun M. Bell
"Broadview"
Amagansett, N.Y.

Dr. Tibor Benedek
25 E. Washington Street
Chicago 2, Illinois

Lester V. Bergman
732 Eastern Parkway
Brooklyn 13, N.Y.

J. D. Brubaker
805 Greenleaf Street
Evanston, Illinois

Dr. W. A. "Don" Cammon
Cameron Surgical Specialty Co.
666 W. Division Street
Chicago 10, Illinois

Ralph P. Creer
American Medical Association
535 N. Dearborn Street
Chicago 10, Illinois

Dr. Edmond J. Farris
The Wistar Institute
Philadelphia 4, Pa.

Louis Paul Flory
Boyce Thompson Institute for
Plant Research
Yonkers 3, N.Y.

Dr. A. Wilson Footer
2828 Summit Street
Oakland 9, Calif.

Dr. J. P. Juhel
St. Francis Hospital
Cincinnati 14, Ohio

J. F. Giordano
85 Court Street
Brooklyn, N.Y.

Dr. Jay M. Garner
723 Elm Street
Winnetka, Ill.

H. Lou Gibson
Eastman Kodak Company
Rochester 4, N.Y.

Ford B. Guerin
6310 Delmar Blvd.
St. Louis, Mo.

Dr. Paul H. Holinger
700 N. Michigan
Chicago 11, Ill.

Victor R. Landi
8211 Grove Street
Silver Spring, Md.

Henry M. Lester
101 Park Avenue
New York 17, N.Y.

Dr. Robert Mallory III
169 Milton Road
Rye, N.Y.

John A. Maurer
c/o Ansco
247 E. Ontario St.
Chicago, Ill.

Stanley J. McComb
Mayo Clinic
Rochester, Minnesota

Ray Miess
1810 N. Farwell Ave.
Milwaukee 2, Wis.

Henry W. Morris
Medical School Photo Lab.
Univ. of Minnesota
Minneapolis 14, Minn.

Leonard L. Perskie
Graphic Studios
231 - 10th Ave.
New York 11, N.Y.

Dr. Arthur W. Proetz
1010 Beaumont Bldg.
St. Louis 8, Missouri

Frank N. Ruslander
Harper Hospital
Detroit 1, Michigan

Albert Sadler
5736 La Jolla Blvd.
La Jolla, Calif.

Florian E. Schmidt, M.D.
320 Wisconsin Avenue
Oak Park, Illinois

Anne Shiras
University Office
Magee Hospital
Pittsburgh 13, Pa.

William J. Taylor
Temple University Hospital
Philadelphia 10, Pa.

Lloyd E. Varden
Pavelle Color, Inc.
533 West 7th Street
New York 19, N.Y

Julius Weber
425 West 263rd Street
Riverdale 63, N.Y.

# BPA Officers and Committee Chairmen

| | |
|---|---|
| President | Edmond J. Farris, Ph.D.<br>The Wistar Institute<br>Philadelphia 4, Pa. |
| Vice President | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Secretary | Anne Shiras<br>University Office<br>Magee Hospital<br>Pittsburgh 13, Pa. |
| Treasurer | Stella Zimmer<br>Photographic Department<br>School of Medicine<br>Syracuse University<br>Syracuse 10, N.Y. |

---

| | |
|---|---|
| Editor of Journal | Leo Massopust<br>Marquette University<br>Milwaukee 3, Wis. |
| Motion Picture Committee | Oscar W. Richards, Ph.D.<br>American Optical Company<br>Scientific Instrument Div.<br>Buffalo 15, N.Y. |
| Committee on Sustaining Memberships | C. Graham Eddy |
| Committee on Grants | Veterans Administration<br>Washington 25, D.C. |
| Annual Salon | Nathan S. Horton<br>P. O. Box 6115<br>St. Laurent<br>Montreal 3, Canada |
| Committee on Fellowships | Ferdinand R. Harding<br>Children's Medical Center<br>Boston 15, Mass. |
| Committee on Local Chapters | Avis Gregersen<br>Department of Dermatology<br>U. of So. Calif. Med. School<br>Los Angeles 33, Calif. |
| Committee on Awards | Leo C. Massopust<br>Marquette University<br>Milwaukee 3, Wis. |
| Traveling Salon | William Stevenson<br>Mt. Sinai Hospital<br>Cleveland, Ohio |
| 1949 Convention Chairman | David Lubin<br>130 Keats Lane<br>Berea, Ohio |

# Officers and Directors for 1949-1950

Article VI of the Constitution provides that nominations shall be made by a Nominating Committee appointed by the President and approved by the Directors. The name of any candidate suggested in writing by 10 or more members must appear on the Official Ballot along with those nominated by the Nominating Committee. The Board of Directors, with a majority of its members approving, may also add names to the Official Ballot. This Article was duly read to the membership at the Business Meeting on Sept. 9, 1948 and was printed in our Journal, Vol. 17, No. 2, Dec., 1948, p. 94. Attention was again called to it in our Journal for March 1949, Vol. 17, No. 3, p. 149, and in this notice were printed the names of the retiring officers and directors, and also the names and addresses of the members of the Nominating Committee. No names of candidates were received from the members, nor have names been added by the Board. Accordingly the ticket submitted by the Nominating Committee constitutes the Official Ballot, as follows:

| | |
|---|---|
| For *President* . . . . | Dr. Oscar W. Richards, FBPA |
| For *Vice-President* . . . . | Mr. C. Graham Eddy, FBPA |
| For *Secretary* . . . . . | Mr. Lloyd Varden, FBPA |
| For *Treasurer* . . . . . | Miss Stella Zimmer, FBPA |
| For *Directors* . . . . . | Mr. H. L. Gibson, FBPA |
| | Mr. Albert Levin, FBPA |
| | Mr. Leo Massopust, FBPA |
| | Miss Anne Shiras, FBPA |

Note: Miss Shiras tendered her resignation as Secretary at the Board Meeting of March 26, 1949 and, because of the pressure of other work, asked that it become effective as soon as possible.

As only one candidate has been nominated for each office, voting for individual offices becomes unnecessary. For this reason the mailed ballot will be omitted this year and the ticket as a whole will be submitted to the membership at the election-meeting September 9, 1949.

# Index

## Journal of the Biological Photographic Association 1932-1949. Volumes 1-17.

### Edited by Oscar W. Richards

The earlier volumes were indexed by Ruth R. Field. Many items and assistance from the surgical viewpoint were received through the kindness of John Fallon, M.D. The later volumes were indexed by the Editor.

For each entry the number preceeding the hyphen is the volume number and that following is the page number. For example 1-109 means that the article is on page 109 of volume one. Most items are listed under nouns and general terms, rather than by adjectives. Camera backs will be found under Backs, Camera; Visual education under education and developing under processing. Sufficient cross indexing is included so that all main items are listed under three or more headings.


Abbe and Schott ---------- 1-109
Aberration, chromatic ---------- 2-143; 5-106
Abney ---------- 2-120
Abstracts ---------- 7-131, 181; 8-41, 91, 141, 193; 9-35, 155; 11-26; 13-152; 14-45, 143
Accident evidence ---------- 6-129
Achromatic, meaning of ---------- 2-146
Aeromedical (Coffey) ---------- 12-136
Agfa color ---------- 2-95
Air bells ---------- 2-206
Airbrush ---------- 1-148; 2-219; 6-101, 108
Alaskan expedition ---------- 3-130
Albino Rat ---------- 9-5
Albums ---------- 3-191; 5-96; 7-89, 174
Alchemists ---------- 1-207
Allen, Roy W. ---------- 3-90
American Medical Association Awards 10-164; 11-32
American Red Cross, films ---------- 3-61
American Standards Association ---------- 7-187; 9-164; 15-48, 119, 142
American Society of Radiographers ---------- 1-141
Amphibians ---------- 9-11
Analyzer ---------- 5-56
Anderson spotlight ---------- 1-22
Animals ---------- 13-29
Animation, see cinephotography
Anschutz ---------- 2-40
Antartica ---------- 7-49
Anthes, E. ---------- 3-191
Anuscope, see endophotography
Aperture stop ---------- 2-20
see also exposure
Apgar, Charles S. ---------- 7-39, 156
Aquarium photography ---------- 4-4; 13-65
Armstrong, E. N. ---------- 13-43
Army, see United States
Arnold, W. ---------- 17-131
Arnspiger ---------- 14-101
Art, commercial ---------- 2-106
Association for Scientific Photography (England) ---------- 11-177; 12-91
Assoc. of Medical Illustrators ---------- 15-100; 16-57, 94, 169
Astigmatism ---------- 5-105
Athanasia and Bull ---------- 2-49
Atomic rays, see Radioactivity
Autoradiographs ---------- 16-65
Audiovisual education ---------- 12-158; 13-47, 73
see also Cinephotography slides
Autochrome plate ---------- 2-193
Autocopy paper ---------- 3-187
Autopsy photography ---------- 5-203; 6-61; 8-173; 13-21; 16-61
see also Gross Specimens and Copying
Avinoff, A. ---------- 6-141
Backrach, M. ---------- 14-157
Back
Filmpack, Graflex ---------- 16-165
Reducing ---------- 12-110; 16-165
Revolving ---------- 3-173
Backgrounds ---------- 2-28; 7-59; 8-138
Clinical ---------- 2-170; 7-135; 12-33; 13-43
Glass ---------- 16-86
Gross, lighted ---------- 1-192; 2-27; 7-193
transilluminated ---------- 13-5; 7-149; 2-85; 16-61
Intense ---------- 3-132
Macro ---------- 1-74
Photomicrographic ---------- 5-11
Room ---------- 2-43
Bacteria, cf. also Cinematography ---------- 17-65
Colonies ---------- 3-159, 60; 6-145
Vi-agglutination ---------- 11-65
Baird, Thelma ---------- 3-193; 4-52; 5-43
Baldwin, S. G. ---------- 15-59
Barbaro, Daniello ---------- 1-106
Barker, A. R. ---------- 6-176
Barker, E. C. ---------- 17-99
Barleben, Karl A., Jr. ---------- 2-157
Barnack ---------- 2-157
Barr, Joseph S. ---------- 13-47
Bausch and Lomb Optical Co. ---------- 1-4
Bayard's prints ---------- 1-212
Bayne-Jones, S. ---------- 1-4, 16, 129
Beal, F. S. ---------- 16-131
Beam-splitter, see Photomicrography
Beiter, John J. ---------- 13-5; 14-101; 15-46; 16-123, 17-139
Bell & Howell Co. ---------- 3-80; 4-48, 107; 5-38; 6-8
Bellows, long ---------- 1-8, 13
Bender, W. ---------- 3-191
Bendikson ---------- 2-125
Benedek, Tibor ---------- 7-116; 8-73; 10-184
Benedetti, Giovanni B. ---------- 1-106

Berek, M. ----------2-19
Berens, Anthony F. ----------11-99
Berkhofer, William R. ----------13-131
Bibliography,
General-----1-163, 216; 2-55; 106, 173; 7-182
Cinephotomicrography ----------2-53
Bichromate bath ----------1-200
Bichromated gelatin ----------2-195
Binding the Journal ----------5-155
Biological illustrations----3-119; 4-151; 5-3
Biological Motion Pictures,
see Motion Pictures
Biological Photographic Association,
Constitution ----------2-224; 4-229
Committees, see officers
Conventions,
1932 New Haven ---------1-60 Second
1933 Rochester ----------2-101
1934 New York ----------3-81
1936 Boston ----------5-1, 94
1937 Rochester ---------5-200; 6-41
1938 Philadelphia ----------6-188
1939 Pittsburgh ---------7-178; 8-43
1940 Milwaukee ----------9-42
1941 Buffalo ----------9-216; 10-32
1942 New York --------10-174; 11-85
1943 Princeton ---------11-132, 178; 12-84, 88, 157
1944 Binghamton ---------13-55, 112; 13-109
1945 New York ---------14-97, 100
1946 Chicago ----------15-30, 97
1947 Rochester ---------15-209; 16-90
1948 Philadelphia ----------17-85
1949 Cleveland ---------17-101, 179
Exhibit, Chicago ----------11-87
Exhibit, Cleveland ----------17-181
Facts and figures ---------11-34; 17-182
Fellows ----------15-94; 17-42
Incorporation ----------8-149
Journal, microfilmed------9-219; 15-163
Members, new----------4-54, 173, 225; 5-42, 100, 156; 6-44, 97, 143; 7-48, 93, 144, 189; 8-47, 151; 9-47, 167, 221; 11-35, 91; 12-41
Members, sustaining-- 5-90; 7-47, 91, 189; 8-98, 149, 202; 9-46, 112, 169, 221; 11-39, 93; 12-41, 93, 137; 13-56, 113, 157; 14-53, 103, 149; 197; 15-52, 103; 16-45, 92, 138, 186; 17-84, 189
News--2-171, 222; 4-52, 117, 171, 224; 3-25, 81, 138, 189; 5-41, 94, 152, 200; 6-41, 96, 140, 188; 7-43, 80, 140 186; 8-43, 98, 149, 199; 9-44, 111, 161, 216; 10-44, 96, 149, 205; 11-31, 85, 130, 177; 12-40, 84, 132, 157; 13-55 109, 154; 15-49, 97, 201; 16-41, 83, 132, 177; 17-43, 85, 147, 183
Members in service----------11-33
Objectives ----------1-1
Officers and committees-----3-81; 4-229; 7-91; 9-168, 222; 11-92; 12-86, 93; 13-60, 116; 14-99, 102; 15-53, 102, 158, 210; 16-44, 93, 128, 176; 17-47, 17-190
War service ----------11-89
Biological Photography in Antartica-----7-49
Bombay ----------7-140
Equipment ----------9-136
New Zealand ----------7-87
Survey, 1941 ----------10-137
Planning ----------9-136
Production credit ----------4-59; 9-100
Stereo ----------11-5
Biotachygraphy ----------2-49
Birds ----------9-195; 10-55
Blanquart-Everard ----------1-213
Bleaching, see processing
Bloch, Olaf, ----------5-134
Blood, see also Photomicrography
Cells ----------5-114
Platlets ----------1-57
Stains ----------5-115
Bohrod, Milton G. ----------13-5
Bone ----------13-171
Book reviews,
American Annual-----1943, 11-56; 1944, 12-54; 1945, 13-149; 1948, 16-50; 1949, 17-71
All Movie book ----------9-30
Amateur Photogr. pract. ----------4-123
Better Photogr. ----------16-22
Biology, Intro. to----------8-86; 10-34
Chemistry, Elem. Photo. ---------3-200
Cinematography, Roentgen ---------4-29
X-ray ----------4-50
Clinical Lab. Mpth. Diag. ---------4-51
Colored objects, photgr. of --------4-124
Contax guide ----------15-22
Corrective photogr. ----------16-183
Estomago, photogr. del. ----------8-127
Exacta guide ----------15-22
Frog, Atlas of ----------9-86
Graphic Graflex photogr. ---------16-40
Infrared—Clark ----------8-33; 15-142
Mikrophotographic ----------4-124
Industry, Photogr. in ----------14-144
Journal, PSA ----------16-40
Leica Guide ----------15-22
Manual ----------16-40
Medical History, J. of ----------14-190
Photogr. ----------15-190
Physics ----------12-186
Research ----------15-142
Microfilm sources ----------10-76
Movie making ----------3-30
Natural history, with camera -------11-56
Negative—Adams ----------17-71
New York ----------14-144
Photogr., Facts & Formulae --------16-22
Handbk. ----------8-86
Photomicrography ----------4-123
Amateur ----------15-22
Photogr. Abstracts ----------15-141
Photo. Lab. Index --------12-186; 15-142
Rolleiflex guide ----------15-22
Scientific photogr. ----------10-34
Skin diseases ----------3-200
Theory, Photogr. Process—Mees---11-120
Vet. Clin. Photogr. ----------17-70
Wartime Med. ----------11-12
Years Photography, RPS -1939-40, 8-127; 9-86; 10-76; 11-56; 12-54; 13-108; 14-75; 16-56; 1948-49, 17-71
Bordon, Daniel L. ----------1-21
Borshal, Alfred ----------2-73
Bosse, K. K. -----1-117; 3-139, 141, 147, 194; 4-220
Boston Chapter -----4-171; 9-44; 14; 194; 15-203; 16-182; 17-184
Botanical photography, infra-red ------4-191
Box, light, see Backgrounds, Copying, Gross, Stands
Boyd, G. A. ----------16-65
Bradley, John G. ----------8-178
Breedis, Charles ----------8-173; 10-71
Brewster, W. W. ----------16-129
Bronchoscope, see Endophotography
Brooks, Burleigh ----------2-220
Brown, S. G. ----------17-3
Brownian movement ----------2-50, 52
Brubaker, J. D. ----------9-87; 10-11, 82; 14-3, 25; 15-1, 73, 171
Bruner, J. M. ----------5-13; 6-89
Bruner, Julian M. ----------4-78

Brushes, retouching ----------3-39
Bryan, Arthur H. ----------3-59
Bunchez, Samuel H. ----------11-52
Bucky, Gustave ----------9-149
Bunoan, Pedro ----------1-79; 2-92
Burrow, T. ----------17-155
Burton ----------4-71
Busanovich, G. M. ----------7-105
Buschman, L. E. ----------1-27
Butterfield, John V. -------6-155; 10-175; 14-101
Buxbaum, E. C. ----------3-138
Calcite ----------5-47
Cameras, see also Cinephotography, Photomicrography
Alphatron ----------13-146
Automatic ----------9-149
Argus ----------11-16
Box ----------2-151
Burton ----------4-71
Butler ----------2-191
Contax ----------6-192
Coreco ----------9-149
Eastman clinical ----------2-78
Eyemo ----------2-32
Field ----------5-159
Gaumont ----------2-191
Leica ----------1-92; 2-156; 6-61; 13-137
Nooky ----------8-38
Miniature ----------2-157, 163; 6-33
Microdak ----------4-105
Remote control of -------1-27, 28; 5-159; 13-137; 11-16
Rexograph ----------2-79
Second ----------1-23, 25; 8-9
Surgiscope ----------13-146
Camera and easel, alignment ----------3-134
Canada, films of ----------3-130
Cancer films ----------3-63; 16-168
Canti, R. G. ----------1-6, 12, 15, 16
Capillaries in cutick ----------5-134
Carbo process ----------2-196
Carey, Eben J. ----------10-159
Carlile, Julian L. ---------3-164; 5-96; 7-59
Carter-Reeve color ----------4-132
Catalogs film, see Motion Pict. comm.
Cave Photography ----------9-51
Cellular elements, demonstration -----17-115
Cement, film ----------4-168
Rubber ---------- 2-30; 6-111
Centenary of photography ----------8-87
Cervix uteri------4-63; 5-13, 18, 19; 12-3
See also Endophotography
Chapters,
See Boston, Cleveland, Chicago, Los Angeles, New York, Pittsburgh, Northern Ohio, Southern California, West Virginia
Charipper, H. A. ----------3-82
Charts ----------3-167; 3-166
see also Slides
Chemicals, see Processing
Chicago Chapter ----------3-26, 191; 13-57; 14-194; 15-204; 16-180; 17-185
Child patients ----------3-75
Chile, Scientific Photography ---------12-80
Cinephotography, see also Endophotography, Lenses, Lighting, Motion Picture Comm., Operating Room Stands, etc.
Animation --1-117, 121; 3-139, 147, 149; 153, 194; 6-1
Apparatus-----1-126; 2-32; 6-8, 19, 23
Bacteria ----------16-3, 22; 17-65
Embryology ----------7-102
Focusing ----------17-121
Photostats, in ----------1-128
Pseudocystoscopic ---------2-69; 6-89
Technics ----------17-121
Army ----------15-21
Aquarium ----------4-8
Binocular microscope ----------7-127
Biological----1-128; 4-215; 5-24; 7-159; 8-158; 11-65; 16-22
Cameras
Bell & Howell -----1-27; 2-220; 6-25; 14-172
Cine Kodak -----2-32; 5-63, 64; 6-25; 14-172
Cin-ex ----------2-97
Hand crank ----------1-23, 24
Moviekon ----------8-9
Clearing house ----------1-138
Clinical ----------1-139; 14-171
Photographs, aid for close range--17-131
Cole, W. V. ----------17-115
Color----------3-182; 4-141, 145; 5-63; 6-30; 7-70
Committee reports, see Motion Pictures
Dental ----------4-232
Dissolve, polarizing ----------11-70
Editing, -----6-31; 8-9, 80, 128; 14-184
Endoscopic, see Endophotography
Equipment general --2-64, 31; 7-168; 8-9, 80, 128; 12-158
Exposure (see also Exposure meters) 1-21; 3-64; 4-54; 78, 82, 145; 6-161; 8-7, 9-34, 87
Fade-in-out chemical ----------8-131
First aid ----------3-62
Fluorography ----------10-64
Focal frame ----------3-50
Health ----------11-64
High speed --------8-11; 14-107; 16-15
History ----------2-39
Kodachrome—B-W ----------7-70
Laboratory practice ----------5-147
Micro ----------15-3; 16-103
Medical -------3-59, 85; 12-158; 14-171
Obstetric ----------2-60
Planning-----1-137; 2-62, 64; 6-31; 8-9, 80, 128; 12-158; 14-171; 15-43; 16-103, 106; 17-51
Photomicrograpic
Bacteria --1-128; 8-158; 11-65; 16-3, 22
Binocular Microscope -------4-78; 7-127
Clinical ----------1-18, 64
Darkfield ----------1-128, 8-158
Exposure, see Exposure meters & Exposture photomic.
General -----1-4; 2-53; 130, 139; 5-38
Simple ----------2-130; 4-82; 8-7
Preservation ---------2-28; 7-12; 11-152
Prostrate ----------2-69
Radiographic ----------2-98; 16-15
Rat ----------12-113
Reversal ----------1-199
Sixteen vs. 35 mm. -------1-112, 113; 2-60
Slides, with ----------10-41
Sound -----2-60; 4-145; 10-116; 15-150
Sources----------3-174; 4-225, 231
See also Motion Pict. Comm.
Standards for biological ----------4-215
Surgical ---1-21, 23; 2-65; 4-145; 5-63, 161; 6-20, 25, 28, 32, 134; 7-70; 8-9, 80, 128; 11-16; 13-138; 14-184; 16-103
Teaching ----------5-24; 17-51
Technic ----------2-64; 8-11
Telephoto ----------7-39
Time lapse ----------1-4; 3-64; 5-80; 6-84; 145
Tissue culture ----------1-6; 6-84
Titles ----------2-100; 8-128; 14-77
Trick ----------2-32
Cinnabar, Injection ----------8-105
Cleanliness ---------- ----2-182; 5-192

Cleveland Chapter ----------16-179
Clinical, see also Cinephotography, Endophotography, Film, Lighting, Month, etc., Operating Room
Army ----------15-19
Aviation medicine ----------12-163
Bed scale ----------4-201
Capillaries ----------5-134
Children ----------3-72
Criminal ----------6-124
Deformities ----------6-132
General----------1-34, 61; 4-136; 5-74; 12-26; 13-43; 16-57
Grid ----------1-203; 11-127
Infra red ---------2-127; 13-139; 14-190
Mirror ----------6-184
Nudes ----------4-222
Orthopedic ----------4-104; 6-93; 11-15
Plastic surgery ----------16-120
Preparation of patient ---3-72; 16-51, 159
Private patient ----------8-132
Pulmonary motion ----------4-95
Sales ----------10-113
Sumato types ----------16-115
Technic ----------7-153; 9-137
Visualization ----------14-183
Clinical Photography in England------12-132
Cloth backing ----------2-219
Coffey, Lardner A. ----------10-121
Cohen, Milton ----------5-78; 6-142
Cohen, Mortimer, Obituary ----------15-29
Cole, W. V. ----------16-147
Collins, C. W. ----------15-23
Collins, Clyde W. ----------2-69
Collotype ---------- 1-82, 86
Color, see also Cinephotography; Copying; Film, Photomicrography; Slides
Birds ----------10-55
Eye ----------3-98; 9-119
Lumiere ----------2-48; 3-169
Prints ----------2-195; 4-125
Temperature ----------15-13
Colposcope, see Endophotography
Color, Engravers View Point ---------13-101
Color and Illumination ----------9-77
Color contrast ----------2-3
Color filter, see Filters
Columbia University ----------1-3
Comandon, J. ----------1-5, 13, 17; 2-52
Commercial ortho, see Films
Committee on Motion Pictures, see Motion pictures
Competition, print ----4-121; 8-200, 17-89
Competition, Smithsonian ------16-39, 175
Composition, see also Lighting
Blood ----------7-70
Clearness ----------8-138
Consistency ----------13-43
Contrast ----------11-45
Clinical ----------6-131; 14-178; 16-159; 16-169
Naturalness ----------1-61
Operating room ----------7-70, 14-178
Plastic ----------16-123
Skin ----------16-51
Condenser focal length ----------1-64, 66
Confuscius. Spectacles ----------1-106
Conger, Paul S. ----------9-181
Consent, see Permissions
Consent, see Releases
Contrast, lack of ----------3-132
Tone ----------2-11
see also Composition
Contrasto process ----------3-187
Control, x-ray illuminator ---------17-171
Cook, Alan A. ----------4-34
Cook, Robert ----------8-135
Cooper-Hewitt light ----------2-167
Copeland, B. ----------14-3
Copying
Argus ----------6-33
Blue print ----------2-13
By projection ----------7-15
Duplication, direct ----------5-123
Endocamera, with ----------15-73
Equipment ------ 1-159; 2-163; 3-134; 10-20; 14-85
Extension Tubes --------- 11-145; 15-23
Finder frame ----------11-27
Half tone ----------10-20
Holder ----------3-134; 7-33
Immersion ----------1-101
Kodachrome -----8-194; 9-210; 10-202; 12-55; 15-195
of x-ray ----------7-71
Leica ------1-92; 2-76; 163; 4-27; 10-3
MicroTessar ----------1-72
Microphotography -------6-176; 12-115; 13-152
Moving object ----------8-2
Negative ---------- 3-177; 9-142
Proportions ---------- 5-149; 7-14
Stands ---1-192; 5-138; 6-78; 7-33, 34; 12-95; 13-137; 14-167; 16-61
Stained copy ----------3-136
Stereo ----------11-5, 12-13
Transillumination ----------7-149
Translucent objects --2-166; 3-158; 5-185; 7-116, 129
Transparencies ----------13-35
Tri-Pack----------15-195
X-ray --------1-56, 98, 192; 2-163; 7-71
Copylite ----------2-89
See also Lighting
Counting Seconds ----------9-141
Crabtree, J. I. ----------2-100, 197
Crandall, B. S. ----------16-78
Cravon sauce ----------3-38
Credit line ----------3-145
Criminology ----------6-124
Criticism, print ----------4-102, 164, 220; 5-36, 86, 145
Creer, Ralph ---1-23; 3-26, 27, 31, 81, 82, 139, 189, 191; 4-53, 56, 63, 68; 5-13, 189; 15-161; 16-139
Portrait ----------1-2
Curvature of field ----------2-143
Cushman, George W. ----4-78; 5-13; 6-89
Cystoscope, see Endophotography
Cysto-urethoscope, see Endophotography
Daguerre, Chevalier ----------1-211
Daguerre, L. J. M. ----------1-210
Dallmeyer, M. S. ----------1-109
Daphnia ----------1-99
Dark field ----------2-167
Dark room ---1-42; 7-59, 153; 8-189; 12-73
Dekking, H. M. ----------3-88; 6-140
DeLee, Joseph B. ----------2-60
De Lucchi, Milton R. ----------10-137
Dempsey, Addis W. ----------13-101
Dent, R. V. ---------8-7, 165; 9-73; 10-16
Dental photography, see Teeth
Desensitizing color plates ----------3-23
Detail control ----------7-105
Detro, J. C. ----------16-123
Developing, see Processing
Diatoms ----------9-115, 181
Dick, David W. ----------6-171
Depth of focus ----1-68; 2-92; 2-92; 5-123
Dermatology, see Skin
Diffusion ----------1-62, 197; 2-151
See also Lighting
Dinberg, M. C. ----------5-34
Discussion, round table ----------3-171
Dish, Petri ----------3-159; 7-129
Displays and Exhibits----7-72; 10-35; 11-19, 31; 17-31

Dittmann, S. H. ----------16-103
Dittmann, S. P. ----------15-19
Documents and handwriting ----------6-128
Dollies, see stands
Doors, Bronze ----------8-153
Drawing with photography ----3-37, 39, 130
Dry plate ----------1-214
Dryer, Print ----------9-10
Dubray, J. A. ----------2-139, 329
Dufay film ----------5-84
Dunlop, James R., Jr. ------1-72, 114, 136
Dunton, S. C. ------4-8, 56; 5-155; 9-51; 13-29; 14-100, 125
Duplicating Slides, see Slides
Dwyer, Raymond J. ----------10-116
Ear ----------15-1
  Deformities ----------6-134
Earle, Wilton R. ----------7-54
Eastman, see Cameras, Film, etc.
Edison ----------2-47
Editorial Correspondence ----------7-42
Editorials ------1-1, 59, 115, 171; 2-1, 57, 117, 177; 3-1, 85; 4-1, 59; 7-1, 42, 69, 133, 175, 177; 8-39, 135, 192; 9-31, 97, 154; 10-133, 196; 11-25, 168; 12-79, 130; 16-142; 17-37
Education, see also Instruction
  Audiovisual ----------11-26
  Biological ----------3-59
  Cinema and ----------2-48
  Medical ----------9-97; 11-173; 13-73; 149; 14-22; 16-57
  Museum ----------8-187
  Observation ----------14-133
  Photography ----------11-173
  Private practice ----------8-132
  Survey of Films ----------4-174
  Venereal ----------11-21
Electrography ----------7-145
Electronic flash, see Lighting
Elias, Hans ---------- 7-102, 141
Embryological Development Photography 1-97; 5-5; 7-102
Emulsion ----------3-3
  Speeds ----------2-220
  See also Film
End, Edgar ----------8-19
Endophotography ----------15-1; 17-11
  Cystoscope ------2-69; 6-89; 9-25; 13-57
  Cystourethroscope ----------2-69
  Ear ----------15-1, 73
  Gastroscope ----4-74; 9-68; 13-57, 16-23
  Laryngoscope, Bronchoscope, ---9, 67, 203; 10-83; 15-73, 171
  Otoscope ----------15-3, 73
  Peritoneoscope ----------9-69, 14, 163
  Sigmoldoscope ---9-71, 203; 14-25; 16-61
  Thorascope ----------8-91, 193; 9-70
  Truck ----------16-61
  Vagina ------4-63, 68; 5-13; 7-45; 12-3
Enlarger, autofocus ----------3-164
  for Photomicrography ----------3-174
England, photography in ----------14-49
Englebrecht, Hazel ----------1-89
Engraving ----------2-208
Enlargement, Negative ----------7-21
Entomology ----------1-72
Epithelium, ciliated ----------5-84
Equipment, New (Harding) -2-25, 98, 169, 214; 3-23, 25, 72, 77, 82, 130, 178; 4-45, 104, 165, 222; 5-38, 83, 146, 195; 6-38, 93, 131, 184; 7-34, 76, 136, 168; 9-45, 162; 14-188; 16-81, 187; 17-39
Erythrosine sensitization ----------2-119
Estey, Roger S. ----------9-18
European Journals and War ----------8-59
Evans, Raymond ----------1-57
Exhibits, see Displays
Exposure meter
  Calculator rule ----------4-201
  Dremo ----------3-18
  Electrophot ----------1-26
  Extinction ----------6-161
  General Electric ----------12-184
  Gracophot ----------1-102
  Hickock ----------16-34
  Instoscope ----------6-161
  Microscope, for -----3-69; 4-201; 6-167; 7-24, 54; 16-36
  Photoelectric ------1-25, 172; 5-77; 7-54
  Spot, small ----------9-40
  Weston ----------4-201; 12-173; 13-79
  Visual photometer ---3-69; 13-79; 16-36
Exposure calculation ------1-62, 75; 3-2, 12, 69; 4-201; 5-72; 7-105; 8-194; 10-11, 16; 12-173; 13-79, 131; 14-46; 16-36
Eye ------2-6; 3-88, 108; 4-141; 7-2; 8-69, 143; 9-119; 12-9; 14-3
Eye movements studies, Lifwynn camera ----------17-155
Evemo camera ----------2-32
Eyepiece, see Microscope
Fabricus, Georgius ----------1-207
Face ----------6-69
Facsimile ----------1-83
Falkenstein, A. P. ----------10-8
Fallon, John ------13-137; 16-55, 61, 143; 17-31
Farris, Edmond J. ----------12-113
Fay ----------2-39
Fellowships ----------15-94; 17-42, 178
Fellowships (Guggenheim) in photography ----------17-154
Felsen, Joseph ----------7-149
Ferrotype Plate Rack ----------9-10
Filing
  Cloth backs ----------2-219
  Consents ----------15-170; 16-90; 159
  Data ----------11-165
  General ------5-195; 13-45; 15-69, 170
  Inflamible film ----------3-79
  Information ----------17-103
  Prints ----------1-29
  Slides ----------2-219
  Plates ----------1-199
Film, see also Color, Kodachrome, Processing
  Agfa ----------2-95
  Background ----------5-17
  Choice -------2-161; 7-70; 13-45; 16-51
  Color print ----------8-69
  Dryer ----------10-44
  Dufay
  Duplicating, direct ----------5-125
  DuPont ----------2-61
  Dye ----------11-25
  Ektachrome ----------16-188
  Finlay
  Gaevert ----------1-82, 95
  History ----------1-206
  Kodachrome ----------3-182
    Automatic camera for ----------9-149
    Biological ---4-136; 5-74; 6-74; 11-145; 13-65; 14-119
    Light for ----------5-70, 75
    Medical ----4-136; 7-113; 9-97; 10-83; 12-9; 14-3
    Photomicrography ----------12-47
    Reduction of ----------11-21
    vs. Monochrome ----------7-70
    Viewing ----------11-19
  Kodacolor ----------1-139; 2-35, 194
  Ortho ----------1-63; 2-3, 165; 16-51

Pan ----- 1-125; 2-61; 6-31; 7-70; 16-21
Perutz ----- 1-95
Preservation-restoration ----- 2-28, 11-152
Spectograms, wedge ----- 9-36
Translite ----- 5-34
Size ----- 1-23; 2-60; 14-171
Films, see Motion Pictures
Filmstrips, see Slides
Filters
Detail ----- 7-111
Factor ----- 2-10
General ----- 1-63, 120; 5-106, 197; 6-59; 7-16
Infrared ----- 2-119; 5-6
Leaves, for ----- 4-177
Leucocytes, for ----- 5-194
Ortho ----- 2-3
Reduction with ----- 2-133
Skin, for ----- 16-52
Finlay color ----- 2-79, 180
Fischer, A. W. ----- 1-138
Fish ----- 8-1; 13-65
Fixing, see Processing
Flash, see Lighting
Flesch, S. J. ----- 15-13
Flexion of limb ----- 11-15
Flory, Louis P. ---- 3-82; 9-175; 11-103, 155; 12-17, 59
Flower, Radiography ----- 1-89
Wild ----- 15-23
Fluorescence ----- 15-107
Photomicrography ----- 12-121
Fluorography ----- 10-63; 16-15
Focusing ----- 1-23, 27, 69, 94; 2-215; 4-71; 5-78; 6-61, 192; 7-120; 8-38; 9-149; 11-16
Continuous non-parallax ----- 17-121
Foot ----- 10-113
Footer, Wilson ---- 10-13; 11-16, 173; 12-3
Forms, see Filing and Records
Foster, L. V. ----- 2-140; 3-82; 4-14; 8-60
Fox, Jay T. ----- 11-145
Fox, Philip ----- 8-153
Fox-Talbot ----- 1-212
Freivogel, Hans ----- 8-173; 14-101
Fricke, Hugo ----- 1-90
Fuchs, Arthur W. ---- 1-34; 3-25, 82; 4-58, 117; 5-41, 94, 152, 200; 6-41, 96, 140, 188; 14-41
Fungus ----- 7-116, 129; 8-73
On film ----- 16-78
Preventing in sols. ----- 16-131
Gage, Simon Henry ----- 2-233
Gallagher, W. M. ----- 1-91
Gastroscope, see Endophotography
Gaumont camera ----- 2-191
Getz, Forry R. ----- 1-95
Gey, G. O. ----- 1-16
Gibson, H. L. ----- 8-1; 11-45; 13-65; 14-100, 133
Gislen, Torsten ----- 4-3
Glare elimination ---- 1-85; 2-20; 3-176; 5-107
Glass, photography of ---- 1-79; 2-90; 5-185, 188; 6-54
Glasser, Otto ----- 14-95
Glaze, James B. ----- 10-20
Goerz ----- 1-110
Goldsmith, Norman R. ----- 7-5
Goldsmith, Norman R. ----- 7-5
Goodman, Herman ----- 11-121
Goodwin ----- 1-215
Goosmann, Charles ----- 1-201
Gordon, Bernard de ----- 1-106
Graber, T. M. ----- 15-131
Graff, John H. ----- 6-161
Grain, elimination in paper ----- 1-100
Grand, C. G. ----- 3-82
Gravelle, Philip O. ----- 6-50; 7-27, 64
Gray, Gustave le ----- 1-213
Greenberg, S. ----- 14-155
Gregg, Raymond ----- 8-111
Griffith, Fleda ----- 9-1
Gross, Louis ----- 1-79, 172
Gross Specimens, see also Copying, Endophotography, Macrophotography
Breast ----- 10-77
Embryos ----- 2-89
Intestine ----- 7-149
Injection & IR ----- 8-105
General ---- 1-63; 74, 76; 2-57; 3-177; 7-152
Handlens ---- 6-33, 40; 7-113, 135; 8-193; 13-21
Light box ----- 1-79, 162; 2-27, 76, 151; 3-131
Menisci ----- 11-13
Modeling clay ----- 7-13
Polarization ----- 8-173; 13-137
Stereo ----- 8-19
Gun, Photographic ----- 2-43
Guttenberg, John ----- 2-208
Hair, see Skin
Halation, elimination ----- 3-4
Half-Tone and Line Originals ----- 10-20
Halftone ----- 2-211
Hair, surface of ----- 14-157
Hancock, A. F. ----- 14-163
Hansell, P. ----- 16-51
Hardaker, Louis H. ----- 4-201
Harding, A. M. ----- 13-123
Harding, F. R. ---- 1-156; 2-25, 98, 169, 214; 3-23, 25, 72, 77, 82, 130, 178; 4-45, 104, 165, 222; 5-191, 197; 6-91, 132, 184; 7-34, 76, 136, 168; 8-35, 93, 132, 145; 9-107, 142; 10-113, 144; 11-29, 127, 13-43, 98, 106; 14-22, 100, 188; 16-169
Presidents address ----- 12-82
Portrait ----- 13-106
Harding, R. B. ----- 5-149
Hardy, Arthur C. ----- 5-119
Harrison meter ----- 15-13
Harrison, Ross G. ----- 1-72
Harrison, W. Jerome ----- 1-208
Hart, Ethel M. ----- 7-33
Hastings, Willard S. ----- 8-55
Haulenbeek, Joseph B. ---- 1-76; 2-87; 5-185
Haushalter, Eugene ----- 10-159
Hay, Alfred ----- 2-173
Hayden, H. S. ----- 5-159
Hayyam, Jabir Ibn ----- 1-207
Heald, C. B. ----- 2-172
Heard, Osborne O. ----- 1-4; 5-57; 11-5
Hefley, Harold M. ----- 10-165
Heliostat ----- 2-46
Hellmer, Alice M. ----- 13-41
Hellwig, C. A. ----- 2-94
Hemangioma ----- 6-134
Henbest, L. G. ----- 3-2; 7-120
Hedrick, Henri Van ----- 1-111
Henn, Harold J. ----- 4-136; 5-63
Herschel, Sir John ----- 1-213
Hertz, E. ----- 1-138
Heuser, Chester H. ----- 2-89; 11-5
Hewitt, Richard M. ----- 5-167
Hightower, G. I. ----- 2-86
Hill, T. T. ----- 17-103
Hinman, Arthur ----- 9-203
Hip, dislocated ----- 6-133
Hirth, Carl ----- 9-30
History
Biophotography ----- 8-87
Camera obscura ----- 1-49
Chemistry ----- 1-206

Cine (biological) ----------2-39
Color (ref.) ----------8-92
Draper ----------6-38
Lens ----------1-105
Photomicrography ----------13-177
Stereo ----------15-131
X-ray ----------14-95
Hobby photography ----------6-77; 15-59
Hoegli, E. von ----------1-110
Holinger, Paul H. ------10-83; 15-73, 171; 17-11
Hollywood influence ----------2-61
Holslag, Russel C. ----------1-112
Homal, ocular ----------15-31
Homan, Joseph B. ----------1-192; 2-87
Honor Roll ----------7-190
Horton, Nathan S. ---------- 7-97; 9-5
Howard, James R. ----------1-144
Huffman, E. K. ----------15-170
Hull, Wayne M. ----------9-59
Human carcinoma, studies with polaroid color translation ultraviolet microscope--17-152
Human Relations, see also Children, etc., Releases
Chiefs ----------3-72
Lay-professional ----------16-55
News, credit ----------16-133
Patients ----------16-124, 159
Permission, see Releases
Humidors, film ----------2-29
Idea-Session ----------7-9
Illuminating box ----------3-169
Illumination, see Lighting
Immobilizing specimens ----------6-53
Iucubator, ----------1-16; 2-133
Infrared
Criminology ----------6-124
Eye ----------3-104
General ----2-119; 3-177; 4-108; 13-139
Photomicrographic ----------5-20
and X-ray ----------8-105
Skin ----------16-54
Ingraham, Russell ----------13-35
Injection specimens ----------5-23
Injury to patient ----------2-62
Insects, Photography ----------2-49; 8-126
Radiography ----------1-90
Instoscope exposure meter ----------6-161
Instruction in photography ---3-25, 81, 82; 4-52, 55, 102, 117, 164; 5-36; 6-25; 7-70; 8-128; 11-74; 14-171
International College of Surgeons -----13-42
International Congress of Scientific Photography ----------3-27
Intestine transparencies ----------7-149
Ives, C. E. ----------2-100
Jamaica, color film of----------6-141
Janssen ----------2-39
Glass, Jena, optical ----------1-109
Johnson, George F. ----------10-35
Jones, F. T. ----------15-193
Jones, H. Chapman ----------1-111
Jones, Tom ----------13-72
Journal, Biological Photographic Association on Microfilm ----------9-219; 15-163
Julin, L. A. ---3-25, 81, 82; 4-52, 55, 102, 117, 164; 5-36; 6-25; 7-70; 8-128; 11-74; 14-171
Junction Box ----------9-73
Karth, E. B. ----------4-151
Kelley, Muriel ----------8-187
Kellogg, H. B. ----------3-191
Kelvin, Lord ----------1-9
Kepler ----------1-107
Kieffer, Jean --- 2-178; 3-27, 82, 84, 141, 145, 193, 194; 3-27, 82, 84, 141, 145, 193, 194; 4-95, 220; 5-103, 194
Kingery, H. M. ----------2-130
Kingsbury, Katherine W. -------3-81; 4-57
Kleiden, R. W. ----------15-143
Knight, Paul ----------6-142
Kock, F. L. P. ----------9-119
Kodachrome, see Film
Köhler illumination ----------2-18
Kornhauser, S. I. ------1-91; 12-47; 14-119
Kruse, W. F. ----------1-205
Kryptocyanine ----------2-120
Kuhn ----------1-135
Kutscher, Charles F. ----------8-142
Kwett, Oscar F. ----------2-207
Laminagraphy ----------7-89
Lamp Characteristics ----------9-18
Mercury ----------2-170
Lamoreux, W. F. ----------9-195
Lantern Slides, see Slides, Projection
La Rue, M. W. ----------15-1, 143
Larson, Carroll B. ----------9-97
Laryngoscope, see Enodphotography
Lawson, H. B. ----------14-91
Layout, page, see Reproduction
Plant, see Organization
Leaves, photography of ----------4-177
Lebowich, R. J. ----------5-34
Lee, H. W. ----------1-111
Leica, see also Copying, Stands ---1-92-, 96; 2-157, 166
Leitz, E. Inc. ----------1-4, 12, 13
Leica, see also Copying, Stands ---1-92, 96; Biological photography, for 4-34
Cine ----------14-174
Ektar ----------16-187
Coating ----------11-26; 14-59
Dallmeyer, ----------1-109
Depth of field ----------9-36
Exhibit ----------3-77
Flanges ----------3-76
General ----------1-62; 4-34
Goerz ----------1-110
History ----------1-105
MicroTessar ----------1-72
Long focus ----------2-92
See also Telephoto below
New glass for ----------16-189
Photomicrography, qv., ----------15-31
Ross ----------1-109
Steinheil ----------1-109
Taylor ----------1-110
Telephoto ----------2-160, 92; 5-163; 7-10, 39, 156; 13-153
Testing ----------7-120; 14-76
Voigtlander ----------1-108
Lens hood ----------5-191
Leonard Wood Foundation ----------16-135
Lester, H. M. ----------14-101, 107
Lettering ----------10-123
See also Slides
Leventhal ----------6-19
Levin, Albert ----------7-113
Lewis, Warren H. ----------1-6, 8, 10, 14
Lifwynn eye-movement camera, studies 17-155
Light, see also Lighting ---------1-104; 5-44
Diffused ----------3-131
Dimming ----------9-206
Halation ----------2-65
Point-o-Light ----------1-15
Resolution of ----------1-66
Ribbon filament ----------1-15
Spot ----------1-25
Time lapse ----------1-15
Lighting
Applications
Animation ----------1-74, 197; 3-48
Cavities ----------2-72
Cervix ----------4-63, 68
Gross ---------- 1-81; 2-85, 151; 16-61
Intestine ----------7-149
Immersion ----------1-77

Month ----------2-72; 4-68
Moving object ----------8-2
Photomicrography -----1-64, 74; 2-16; 16-36
Skin ----------5-145; 16-52
Transparent objects -----2-166; 3-158; 5-185; 7-116
Tumors ----------5-191
Color ------ 5-75; 7-135; 15-13; 16-169
Composition ----------3-73; 5-86; 7-105
Clinical ----------6-131; 16-159
Curved surface ----------1-62
Front & Side ----------5-146
Lateral ----------2-98
Light painting ----------1-162; 15-23
Rembrant ----------16-173
Specimen ----------1-79
Systems ----------4-33; 93
Upper left ----------2-57; 3-177
Equipment
Black shields ----------15-46
Box ---------1-81; 2-85; 151; 7-149
Burton mirror ----------4-71
Foot switch ----------8-10
Pipe stand ----------1-192
Quartz rod ----------4-24
Reflectors ----------1-38; 78
Spot ---------1-139; 2-72; 4-68; 8-10
Focusing ----------16-103
Submarine ----------4-4, 7, 10
Sun ----------4-145
Truck ----------16-61
Flash ---------1-34; 2-169; 9-73; 14-125
Breakage ----------7-11
Electronic ----------9-109; 16-36, 99
Liljegren, J. E. ----------16-99
Lindbergh pump ----------5-185
Line engraving ----------2-110
Lithography ----------4-210
Little, Elbert ----------4-54
Loewenstein, Erich ----------12-121
Long distance with IR ----------2-121
Los Angeles Chapter -------15-205; 16-181
Loucks and Norling Studios -----1-117, 121
Loup binocular ----------5-199
Loveland, R. P. --1-9, 13, 14, 17, 128; 5-74; 12-143; 13-79
Lumiere claw movement ----------2-48
Color plates ----------3-169
Luminography ----------10-184
Lutz, E. G. ----------1-114
Macrophotography -----2-76, 85; 4-27; 6-47
Madden, William J. ----------9-10
Maddox, Richard Leach ----------1-214
Magnification ----------3-10; 13-41
Maier, Eugene ----------7-129
Mains, E. B. ----------10-3
Malaria ----------5-137
Mallory, Robert, III ----------12-158
MAMAS, see Museum and Medical Arts Service
Manuscripts by infra-red ----------2-125
Maresh, C. ----------13-123; 15-107
Marey, E. J. ----------1-15; 2-40
Marfaing, Adolph ----------7-2
Martensen, William ----------3-26; 4-52
Martinsen, William L. M. -8-19; 9-100, 136
Masks, frisket ----------6-113
Massopust, Leo C. ---3-25, 26, 81, 82, 139; 4-57; 5-20; 6-140; 8-126; 9-42, 115; 10-159, 164; 13-139; 14-190
Award ----------17-64
Portrait ----------17-64
Matthews, G. E. ----------2-179
Maurer, John A. ---10-23, 123; 12-13; 173
Mayne, Bruce ----------5-137
McComb, Stanley J. --- 5-31; 7-152; 9-210; 11-21; 12-115; 16-151
Portrait ----------14-139
McFarlane, J. W. ----------3-50
McKay, Herbert C. ----------4-86, 120
MacMullen, Grace ----------3-81; 4-58
Medical Art, United States Army 10-145; 11-100
Medical Education ---------11-173; 12-158
Medical films, First----------2-48
Camera equipment for ----------11-57
Sound ----------10-116
Worlds Fair ----------8-34
See also Motion Pictures
Medical museum & arts detachments---14-195
Meech, F. B. ----------5-134
Mees, C. E. K. ----------2-5
Mellors, R. C. ----------17-152
Menge, Edward J. v. K. ----------1-99
Metallographic plate ----------5-6
Metamorphosis of Samia cecropia -------11-3
Mettler, Fred A. ----------7-21
Michael, M. ----------16-165
Microcinematography, see Photomicrography Motion Picture
Microfilm, see Copying
Microfilm, Journal BPA -------9-219, 15-163
Micro-Ibso attachment ----------2-161
Microdak ----------4-105
Microfilm. B.P.A. Journal on --9-219; 11-87
Micro-organisms, water ----------17-99
Microphotography ----------6-176; 12-115
Microradiography ----------5-145
Microscope, see also Photomicrography
Books on ----------2-233; 9-220
Binocular in photography ---2-90; 6-78; 7-127
Eyepiece ----------2-141; 150
Amplyfying ----------2-131
Compensating ----------2-147
Demonstration ----------5-134
Haygenian ----------2-146
Kellner ----------2-149
Motion picture ----------7-127
Objectives ----------1-67; 2-141
Apochromatic ----------1-67
Centering ----------1-69
Miess, Ray -------11-3; 12-64, 186; 13-108, 149; 14-75, 144; 15-142; 16-40, 56, 122, 142, 183; 17-71
*Mikropolychromar* ----------13-123
Mila, E. ----------3-82
Military
Aero ----------12-163
Army ----------15-19
Miller, B. S. ----------16-168
Miller, David ----------9-203
Milne, Lorus J. ---9-200; 13-10; 14, 59, 101
Miniature camera, see Cameras
Mirror for focusing ----------5-113
Photography ----------2-44; 5-161
Mitchell, R. ----------4-82
Molding and casting ----------6-145
Monochrome vs. Kodachrome ----------7-70
Morgan, Willard D. ----------1-92
Morgana process, ----------1-48
Morris, R. H. ----------14-101
Morton, H. E. ----------15-161; 16-139
Motion, animals ----------2-39
Bacteria ----------1-128; 8-158
Motion Pictures, see also Cinephotography 3-61, 62
Motion Picture Committee, reports:---3-141, 194; 17-65; 4-215; 5-205; 7-92, 143; 8-95; 9-165; 10-102; 11-136 12-188; 13-150; 14-140; 15-161; 16-139; 17-135
Mott, P. H. ----------16-145

Motor
Synchronous ----------2-221
Telechron ----------3-64
Motor end plates ----------10-159
Mouth, see also Teeth ---2-25; 2-72; 4-68; 15-120
Multiplex Display Fixture ----------1-156
Museum and Medical Arts Service
1st (India) ----------12-87, 191
2nd (England) ----------12-87
3d (Africa) ----------12-87
4th Detachment ----------12-187
5th Detachment ----------12-46
6th Detachment (Italy) ----------13-136
Museum, Photography, ----------8-187
Muybridge ----------2-39
Mycology, see Fungus
Naidorf, C. P. ----------15-69
Naturalists Directory ----------15-12
Nature photography ----------3-50
Neblette, C. B. ---1-111, 208; 2-106, 173, 233; 4-123, 235
Negroes, IR photography of ----------2-127
Neocyanine ----------2-120
Nerves, regenerating ----------5-52
Neumann, Franz ----------1-129
New York Aquarium ----------5-155
New York Chapter ----------3-190; 17-186
Nicholas, J. S. ----------3-139; 5-5
Nicol prism ----------5-47
Niepce, Joseph Nicephore ----------1-107, 210
Norling, J. A. ----------1-114, 121; 6-19
Northern Ohio Chapter ----------17-186
Numerical aperture (N.A.) ---1-66; 3-10; 8-60

Objectives, see Lenses, Microscope
Observation from photogr. ----------14-133
Oculars, see Microscope
Odquist, G. ----------4-3
Obstetrics, see Cinephotography, Clinical, Operating Room
Oliver, C. B. ----------15-195
Onimus ----------2-39
Operating room, see also Cameras, Cinephotography, Films, Motion Pictures, Stands
Camera angle ----------1-24
Composition ----------7-70; 8-10; 14-178
Filters ----------1-25, 26
Finders ----------6-61, 125, 192
General ----------1-21, 23, 141; 2-60; 4-145; 5-63; 159; 6-25; 11-16, 18; 13-146; 14-171; 16-103, 123
Guide light ----------1-27
Lighting ---1-22, 61, 175; 5-160; 13-137; 14-171
Flash ---7-11; 8-10; 11-16; 13-145; 14-182
Kodachrome ----------5-70; 6-31
Mirrors ----------4-71; 148
Solite ----------5-26
Spot ----------1-27, 28; 4-142; 16-105
Precautions
Bulb Shatter ----------7-11
Heat ----------2-61; 4-145
Safe distance ----------14-183; 16-112
Spark-proof equip. ----------1-25, 27; 5-65; 16-61, 109
Sterility ----------1-23; 13-146; 14-136
Remote control ---1-27, 28; 5-159; 11-6; 13-137
Right angle mirror ----------16-111
Specialists, see Endophot., Orthopedics, etc.
Table. adjustable ----------1-23
Opps, Francis A. ----------2-151
Opthalmoscope, see eye
Optical staining ----------13-123
Optics, see Lenses, Microscope, Photomicrography
Organization
Army ----------15-19
Equipment ----------11-57
Dark room ----------12-73
General ----------14-22
Human relations ----------3-72
Layout ---1-42; 7-59; 153; 8-189; 12-73
Professional relations ----------16-55
Statistics ----------9-100, 188
Studio length ----------1-61; 2-93
Survey ----------10-136
Ornithological photography ----------7-97
Orthopedic
Children ----------3-73
General ----------4-104
Lighting ----------6-132
Measuring screens ----------1-203, 11-128
Posture ----------8-92
Range of motion ----------6-93; 11-15
Sales ----------10-113; 11-13
Orthodontia, see also Teeth ----------6-68
Otoscope, see Endophotography
Peritoneoscope, see Endophotography
Pathology, see Anatomy, Gross Specimens, Photomicrography
Palmer, Vincent ----------14-101
Panchromatic, see Film
Paper negatives ----------1-101
Parafilm ----------6-39
Patents, alien ----------11-133
Patient-photographer relationship, intra-oral photography ----------17-139
Patten, Bradley ---1-6 to 8, 11, 13, 14, 15
Pavelle Laboratory ----------14-90
Payne, William F. --1-159; 2-72, 89; 11-51; 12-26; 13-21; 14-77; 15-120
Peckham, R. H. ----------8-69
Pegbar for animation ----------3-147
Pen and Ink drawings ----------3-37
Peritoneoscopic photography ----------14-163
Perkins, Earle Bryant ----------7-49
Permissions, see Releases
Petri Dishe ----------3-159; 7-129
Petrunkevitch, A. ----------3-192
Petzval, Joseph ----------1-104, 108
Phantom photographs ----------6-91
Pharyngeoscope, see Endophotography
For focusing ----------3-68
Phase, see Photomicrography
Phonoscope ----------2-46
Photochronography ----------2-39
Photo drawing, see Titling ----------3-37
Photoelectric Exposure Meter
See Exposure Meters
Photo-engraving ----------2-207; 4-151; 13-101
Photographic Data, see Filing, Records
Photographic Department finance, see Organization
Photographic Society of America ----------3-195; 4-230; 12-134; 13-42
Photographs, close range ----------17-131
Photography, Guggenheim fellowship--17-154
Intra-oral ----------17-139
Photomacrography ---1-63; 6-47, 58; 12-9, 95; 15-198
Photometer, see Exposure Meters
Photography, general ----------3-89; 119; 7-70; 11-45; 14-41, 135; 16-60
Photomicrography, see also Exposure Meter, Cinephotography
Beam-splitter ----------2-131, 161; 3-68; 7-127
Blood ----------5-113, 194; 11-65
Bullets ----------6-125
Color ----------2-178; 195; 3-169; 4-161; 5-75; 7-181; 8-115; 9-77; 10-71
Darkfield ----------1-130 16-3, 22

Exposure in ___ 3-3; 6-161; 7-27; 54, 67; 8-62, 116; 10-165; 12-173; 13-79, 131; 16-29, 36, 99, 147
Faults in ___10-175; 12-151, 193
History ___2-39; 14-91; 13-177
Illumination __2-16; 3-176; 5-103; 6-155; 7-27, 64; 9-77; 10-71; 12-57, 93, 143, 164; 13-79, 131; 16-34
Infrared ___2-126; 5-20
Living tissue ___4-24; 16-27
Magnification ___7-121; 13-41
Motion Picture, see Cinephotography
Mycology ___8-73
Notes ___10-109
Optics, see Microscope
Optical staining ___2-140; 5-3; 13-123
Phase ___13-111; 16-29
Polarized light ___5-43; 13-151
Processing ___3-3
Records ___4-86; 13-41
Resolution ___8-165; 10-109
35 mm. ___1-130
Stained Slides ___5-114, 115; 12-143
Stands ___1-93; 15-198; 16-61; 17-59
Stereo ___2-22; 16-34
Technic ___1-93; 2-140; 4-24, 105; 5-10, 64, 78, 119; 7-21; 8-7; 12-121, 161; 13-187; 14-45, 155, 166
Ultraviolet ___4-14
Vibration, elimination ___1-41; 8-55
Photomicroscopy, use of filters ___17-115
Photostats ___1-128
In copying & slide making ___17-81
Pierce, H. F. ___2-87
Pigments and dyes IR ___2-125
Piper, Adrianus ___ 8-158; 11-65; 16-3; 22; 17-65
Pilcher, John F. ___6-61
Pin hole camera ___1-49
Pittsburgh Chapter ___7-5; 14-194
Plant Photography ___7-59; 10-3
Plastic Photography ___5-146; 16-123
Plastic Trick Film ___7-102
Point-O-Light lamp ___1-64; 2-17
Polaphotography
Dissolving shutter ___13-10
Enlarger ___14-155
Microscopic ___5-43; 13-171; 16-147
Operating room ___13-137
Postmortem ___8-173; 13-21
Screen ___10-121
Various ___5-55
Polaroid color translation ultraviolet microscope, studies of human carcinoma__17-152
Postmortem, see Autopsy, Gross Specimens
Poole, Hamilton H. ___1-100; 4-210
Porter, Eliot ___10-55
Portraits, child ___3-73
with IR ___2-15
Poser, Max ___1-102
Positives from X-rays ___2-219
Positive transparencies. 35 mm. ___13-35
Prát, S. ___ 4-191; 7-145
Precautions, see Operating Room
Preservation, see Cinephotography
The President's Message ___1-2; 2-103; 3-31; 4-111; 5-87; 6-136; 7-80; 9-102; 11-74; 12-82; 15-96
Price, Zane ___17-59
Print arrangement ___3-24
Quality ___ 1-87; 5-189; 8-49
Printing, see Processing
Printing. Intaglio plate ___2-209
Processes, see New Processes
Processing
Agitating ___2-204
Bleaching ___3-39, 41, 43
Chemicals ___1-206; 4-223
Control ___11-103, 155; 12-17, 59
of detail ___7-105
Developer ___3-132
X-ray ___1-40, 6-153
Universal ___4-170
Developing ___4-223
Direct duplication ___5-123
Drying ___10-144
Enlarging ___5-159
Film ___2-28
Fixing in Salt ___1-211
For reproduction ___1-142
Fade out, chemical ___8-131
History ___1-206
Lined screen ___1-203
Motion picture ___8-12
Overexposure ___5-36
Paper negatives ___1-101
Pavelle color ___14-90
Plates, color ___3-23; 4-110, 170
Prints ___3-181
By projection ___4-45
Color ___4-32; 8-69
Curling ___16-191
Drawing from ___3-46
Glossy ___16-191
Improvement ___16-151
Mounting ___1-142; 3-129; 13-45
Photoengraving ___4-157
Proportions ___5-149; 8-190
Quality ___5-189; 8-49
Rapid ___14-46
Reduction ___2-29; 3-42; 11-19, 21
Reversal ___1-199
Safelights ___5-148
Transfer process ___2-196
Transparencies ___1-159
Proetz, Arthur W. ___6-85; 7-133, 175; 8-39; 12-73
Projection
Bell & Howell ___5-38
Comparative ___16-143
Filmo 16 mm. ___3-79
General ___1-111; 3-6; 4-113; 5-167; 7-9, 168; 10-123
Lens, test ___14-76
Microfilm ___13-152
Screens ___10-35
Selectoslide ___9-36
Stereo ___12-13
Truck ___16-188
Slides ___4-111; 10-123
Proctoscope, see Endophotography
Prosthodontia in portraits ___6-68
Prostate ___6-91
Publication ___10-143
Publishers' Requirements for Prints __10-172
Pulmonary motion ___4-95
Pyrogallic acid ___1-214
Questionnaires, Data ___13-155
Rack, ferrotype ___9-10
Radiographs, Copying, see Copying
Radiography, flowers ___1-88
Insects ___1-90
Small specimens ___5-138
Rats, photography of ___9-5; 12-113
Reade, J. B. ___1-212
Reather, Chester F. ___2-83
Records ___1-1; 2-96, 219; 5-195; 7-129; 8-178; 11-165; 14-41; 15-69, 167; 16-90, 159; 17-103
Rectosigmoid ___9-203
Reducing apparatus ___1-197
Backs, Camera ___12-110
Kodachromes ___11-21
Reduction finder ___3-164
Redway. Laurance D. ___7-2
Reed, R. Donald ___11-19

Reeve, Roy M. ----------4-132, 161
References, photography ---2-55, 117, 139; 5-136
Reflex focusing ----------3-171; 6-50
Photomicrography ----------6-49
Registration, drawing board ----------1-125
See also Cinephotography, Animation
Rehman, I. ----------16-15
Releases ----------15-170; 16-60; 16-159
Reproduction
Collotype ----------1-82
Color ----------13-101
Layout for ----------1-142; 3-123
Offset ----------4-210
Photoengraving ------2-207; 4-151; 4-158
Preparation of prints ----------13-77
Viewpoint of ----------7-175; 8-39
of publisher ----------10-172
Tables ----------5-167
Reptiles ----------9-11
Resolution ----------1-66
See also Photomicrography
Retouching ----------1-144
Reversal ----------1-199
Rheumatism ----------5-134
Ribbon filament lamp ----------1-64
Richards, C. H. ----------11-57
Richards, Oscar W. ---2-39; 3-27, 64, 81, 139, 141, 194, 197; 4-54, 58, 175, 215, 220; 5-24, 205; 7-16, 92, 143, 159; 8-95; 9-77, 165; 10-102, 109; 11-136; 12-188; 13-150; 14-101, 104, 140; 15-161; 16-29, 139
Ries, J. ----------1-5, 13, 18
Rinaldy, E. S. ----------5-80
Ritter ----------1-209
Roberts, T. W. ----------17-121
Rockefeller Institute ----------1-3
Rockwood, Reed ----------1-57
Roentgenographic photography
Cine, high speed ------4-49; 8-41; 16-45
Copying ---1-98, 156, 192; 2-163; 3-177; 16-129
Macrophotography by ---1-90; 5-138; 6-78
Pulmonary motion ----------4-95
Stereo -------7-71; 9-142; 10-13; 11-51; 16-129
Roentgen rays ----------8-105;14-95
Roger, Henry -----1-4, 14, 18; 2-69; 3-82; 12-9
Rosebrook, L. E. ----------5-13
Rosenberger, Heinz
See Roger, Henry
Ross lens ----------1-109
Ross, Thomas E. ----------7-149
Round table discussions ----------3-171
Roy, E. J. ----------1-199; 2-22
Royal Photogr. Soc. ---------7-188; 17-134
Royer. George L. ----8-115; 13-125; 15-107
Sabin incubator ----------2-133
Sadler, Albert ---10-77; 12-161; 14-9; 15-31; 16-159; 191, 17-171
Safe light ----------1-39
Safety, see Operating room
Sage, Robert A. ------4-53; 9-188; 12-110
Salon, 1939 ----------8-98
1940 ----------8-199
1941 ----------9-217
1943 ----------12-90; 13-115
Salon, hanging ----------14-124
Specifications ----------13-115
Samia cecropia, Metamorphosis ---------11-3
Sarnoff, Jacob ----------4-145
Sass, J. E. ----------15-198
Scheele, Charles William ----------1-209
Schlemmer, J. ----------7-145
Schmidt, Louis (1866-1945) ---1-142, 209; 2-87, 166; 3-1, 25, 26, 81, 82, 123, 158, 171, 191, 198; 4-1, 55, 59, 111, 117, 220; 5-185; 6-47, 136; 7-1, 72; 8-87; 9-102; 10-130, 143
Obituary ----------14-7
Portrait ----------14-7
Schneckenburger, M. G. ----------4-170
Schoeck, Frederick ----------5-123
Schulze, Johann Henrich ----------1-208
Schwartz, Louis ----------11-19
Schwartz, R. ----------1-135
Schwarz, Theodore E. ----------3-119, 139
Scientific photography ----------14-133
Scoliosis ----------6-133
Scott-Archer ----------1-214
Screen plate ----------2-193
Photographic, invisible ----------1-203
Printed in ----------1-204
Screens, see also Projection
Against ----------1-79
For gross ----------1-76; 2-85
Hand light ----------16-64
Macro ----------1-74
Polarizing ----------8-173; 13-21, 137
Stand ----------1-197
Seconds, Counting ----------9-141
Segal, H. L. ----------16-23
Semken, G., Obituary ----------15-102
Sensitized emulsions ----------2-6
Paper negatives ----------2-44
Services to members ----------5-89
Seymour, M. W. ---------- 2-188; 4-125
Shading during printing ----------3-181
Negatives ----------4-47
Shannon, W. J. ----------3-30
Sheard, Charles ----------1-57
Sherwood, H. F. ----------5-138; 6-78
Shinn, Lawrance E. ----------6-33, 145
Shiras, Anne ---3-81, 171, 192; 4-56, 118; 7-9, 43, 80, 140, 178, 186; 8-43, 98, 149; 9-141; 14-90
Shutter, dissolving ----------13-10
Shadow ----------15-193
Sias, Arthur C. ----------1-82
Sigmoidoscope, see Endophotography
Silverman illuminator ----------2-23
Simmons, Charles ----------8-187
Single picture attachment ----------2-134
Skin, see also Filters, Infrared, Lighting
Black shields ----------15-46
Cuticle ----------5-134
General, oil, friction ----------16-51
Plastic ----------16-123
Preparation ----------16-159
Slide rule ----------3-10
Slide films ----------14-77
Sliding copy attachment ----------2-163
Slides
Copying from-----9-210; 10-202; 14-155
Filing ----------1-152
Film slides ---------9-200, 13-35; 14-77
General ------1-198; 2-214; 4-111; 5-36, 180, 134; 13-191; 13-191; 5-167, 16-179, 17-81
Kymograph records ----------17-81
Preparation of material ----------17-177
Serial ----------4-236; 13-137
Size control ----------3-164, 17-73
Strips ----------7-14, 15; 9-200
Twelve together ----------10-8
Typed copy ---------3-187; 5-167; 7-137, 16-179, 17-81, 177
Smith, Arlo I. ----------10-165; 14-101
Smith, Arthur L. ---9-11, 206; 11-171; 12-95
Snake photography ----------14-125
Somato types ----------16-115
Southern California Chapter --------17-187
Southwestern Medical College----------14-24
Spectroscope, hand ----------1-65
Spectroscope plate ----------2-13
Speculum Cylindrical ----------5-14
see also Endophotography

Speed photography, see also Cinephotography ---14-107; 16-36, 99
Spencer, Harvey W.---6-65
Spirochetes ---9-34
Sponge rubber ---1-130
Spotting ---5-83
Stain removal ---3-136
Stained negatives, copying---2-13
Staining
  Blood ---5-114, 115
  Optical ---13-123
Standardization---1-59; 2-57; 16-173, 175
Standards, Biol. M.P.---4-215
Standards, photographic ASA---7-187; 9-164; 15-48, 119
Stands
  Animation ---1-117, 121; 2-32, 69; 3-147; 6-1
  Bank and ---16-61
  Camera ---7-132
  Cine ---8-7, 158
  Combination---1-192; 2-76, 7-59; 16-103
  Copying---1-159; 10-20; 14-87; 14-176
  X-ray ---1-156
  Flash ---13-187; 14-115
  Hand---9-45; 2-160; 7-39; 6-192
  Large objects ---1-76, 79; 2-151; 7-149; 8-173; 11-145
  Leica ---1-92; 2-160; 9-5
  Mouth spot ---14-127
  Operating room---1-24, 27, 28; 5-69; 8-10; 10-121; 11-16
  Balcony ---14-181
  Dolley ---1-24; 6-25; 14-179
  Ladder ---1-22; 12-133
  Polarizing ---13-137
  Pulpit ---1-24; 13-25
  Tower ---8-10; 13-25
  With mirrors ---5-159
  Photomicrographic ---1-4, 29; 3-64; 5-80; 6-84, 145
  Small objects ---1-72
  Stepladder---1-22; 11-171; 12-133
  Strohoscopic ---13-152
  Tripod ---2-37, 65; 16-105
Steinheil, lens ---1-109
Stephenson, Aaron Jr.---10-172
Stereophotography
  Apparatus---2-87; 4-168; 11-5; 15-131
  Eye ---3-95
  Gross specimens ---8-19
  Motion study cellular ---9-175
  Radiographs ---5-141; 6-78; 16-129
  Technic---2-22, 49, 87; 12-13; 15-131
  Ortho ---4-163
Stone, Albert A ---11-19
Stop motion photography, see cinephotography
Storage, see Filing
Stratosphere photography---3-78, 186
Stratoscope, see Lighting
Studio, see Organization
Sturgis, Women ---17-51
Substage condenser ---3-6
Subtractive process ---2-191
Supplementary lenses ---3-54
Surface ---14-157
Surgical, see Operating room
Surgical motion pictures, see Motion pictures
Survey of Biological Photography, 1941 ---10-137
Sutton, F. C. ---16-57, 94
Swindle, P. F. ---8-105
Synchronous motors ---2-221
Syz, H. ---17-155
T binders ---4-222
Taipenot, process ---1-214
Tallmadge, G. K. ---14-190
Target, lens testing ---7-120
Taylor, Edward V. ---12-35
Taylor, Taylor and Hobson, lens---1-110
Teaching, see Training
Teaching films, see Motion pictures
Technic ---1-80; 7,2, 34, 76, 136, 168
Technigraphic Institute ---7-46
Teeth, see also Mouth---1-95; 6-65; 11-51; 12-35
Telechron motor ---3-64
Telephoto Manipulation ---7-156
  See also Lenses, Cinephotography
Temperature Conrol ---1-16
Temperature of solutions ---5-192
Ter Louw, Adrian ---3-82; 4-58
Thal, P. E. ---3-191; 4-74
Thoracoscope, see Endophotography
Three-dimensional magnification ---5-199
Three plate method ---3-116
Time lapse, see Cinephotography
Thomas, H. A. ---17-139
Thyroid ---4-24
Tilting stage, Microscope ---6-49
Time lapse, see Cinephotography
Tissandier, Gaston ---1-111
Tissue overlay ---1-85
Titling
  Air brush ---2-219; 6-101
  Animation, see Cinephotography
  Etching ---5-146
  Lettering ---2-218; 10-130
  Movable letters ---13-45
  Photodrawing ---3-37; 13-185
  Printing ---1-203; 11-15, 127
  Retouching ---1-144
  Rubber cement ---2-29
  Titles, cine ---2-100; 14-77
  White ink ---3-78
Tourmaline ---5-45
Trade Secrets ---1-59
Training (news) ---14-24, 98, 146; 15-50; 16-41, 55
  See also Instruction
Transillumination ---13-5
Transillumination embryos ---5-9
  With infrared ---2-29
Translucent, transparent objects, see also Lighting ---2-166; 3-158; 5-185; 7-129; 7-116, 149
Transparencies ---7-149
Transurethral cinematography ---6-89
Traveling exhibits ---2-105
  Salon ---4-54, 119, 171, 227
Tree ---17-3
Trays, enameled ---4-167
Trichlorethylene preserving ---2-27
Tricolor Sensation Curves ---2-189
Trissel, Howard R. ---13-146
Trucks, see Stands
Tuberculosis, bone ---6-133
Tubes, objects in ---3-159
Tumors ---5-191; 6-134
Tungsten lamps ---2-8
  See also Lighting
Turner, C. E. ---1-57
Tutell, Loren ---4-52
Tutell, L. E. ---3-26, 82
Tuttle, Clifton ---1-4, 13, 112
Tuttle, Harris B. ---1-135; 4-136; 5-57, 63; 10-116
Typewriter type cleaner ---5-169
Typewritten copy lantern slides ---2-217; 3-187
Typhoid Bacilli ---8-158
Ultraviolet
  At operation ---1-61
  General ---15-107, 7-184
  Microscopic ---4-14; 12-121; 7-138; 13-153; 14-45
  Mycology ---10-184

Skin ----------16-54
Ultropak illuminator ----------3-176
Underwater Photography ----------8-119
United States Army, Medical art ----10-145
Medical Corps ----------9-76; 10-164
Medical Museum ----------11-134; 15-19
Dept. Agriculture, films ----------3-61, 62
Public Health Serv. films ----------3-61
University of Maryland ----------2-85; 3-63
Urology, see Endophotography
Uterus ---------- 1-118; 2-59
See also Endophotography
Van Atta, G. R. ----------4-177
Van Slyke, Edgar ----------4-24
Varden, Lloyd E. ----------8-49; 10-63
Varian, Basil B. Obituary ----------17-36
Vascular system
Blood ----------1-57; 5-113; 194; 14-45
Cutical, capillaries ----------5-134
Fundus, see eye
Infrared ----2-119; 3-177; 4-108; 13-139
Injection (x-ray) ----------8-105
Venereal, see General Principles
Vexler, D. ----------1-90
Vibration elimination ------1-41, 130; 6-85
Viehoever, Arno ----------1-98
Viewbox ----------17-31
Vinci, Leonardo da ----------1-106
Visual Education, see Education
Vitamin D assay ----------6-171
Voigtlander ----------1-108
Wald, Donald J. ----------12-55
Waller, R. K. ----------10-71
War, European Journals ----------8-59
War Photography ----------7-91
Washing ----------2-204
Wash-off relief ----------5-33
Wash technic with photograph ----------3-44
Water cell ----------2-74
Water, micro-organisms ----------17-99
Waters, L. A. ----------2-712; 6-124
Watson, J. S. Jr. ----------16-23
Waterman, Lois E. ----------3-27
Webster, S. H. ----------16-99
Wedgewood ----------1-210
Weinberg, S. A. ----------16-23
Weingart, Julius S. ----------4-53
Weiss ----------2-47
Weiss, M. S. ----------1-5
Welch, Albert S. ----------7-127
West Virginia Chapter ----------17-187
Weston, see Exposure Meters
Weston, R. McV. ----------11-165
Wet plate ----------1-214
White objects ----------13-98
Whitley, R. J. ----------11-13, 15
Williams, Hi ----------3-82
Winona school ----------3-196; 4-230
Wisseman, Marie E. ----------8-115
Wolf, Robert D. ----------17-81, 17-177
Wood, Francis Carter -------3-25, 82, 169; 4-53
Wood light, see Ultraviolet
World's Fair exhibit ----------8-34
Wratten filters ----------2-8, 10
M plates ----------2-95
X-ray, see Roentgenographic & Roentgen Rays
X-ray Copy Competition ----------9-44
X-ray films copying, see Copying
X-ray illuminator variable control ----17-171
X-ray photography, see Roentgenographic
Yale University ----------1-1, 3; 5-24
Yellow filters ----------1-63
Light ----------2-4
Senstivity ----------2-119
Stains ----------2-12
Zeiss ----------1-109
Zieler, H. W. ---------1-41, 60; 2-16; 5-55
H. Z. ----------3-55
Zimmer, D. J. ----------16-99
Stella ----1-152; 4-53, 118; 5-117; 7-153
Zimmerman, L. W. ----------3-166
Zoo photography ----------13-29
Zoöpraxiscope ----------2-40

## For Sale: Microscope and Equipment

1 Model DDE-20 Bausch & Lomb research microscope with:

| | | | |
|---|---|---|---|
| 48 | mm. | achromatic obj. | N.A. 0.08 |
| 16 | mm. | apochromatic obj. | N.A. .30 |
| 8.3 | mm. | apochromatic obj. | N.A. .65 |
| 4 | mm. | apochromatic obj. | N.A. .95 |
| 2 | mm. | apochromatic obj. | N.A. 1.30 |

7.5 Compensating Eyepiece
10 Compensating Eyepiece
12.5 Compensating Eyepiece
25 Compensating Eyepiece

Regular binocular tube, and monocular tube for photomicrography; dark-field paraboloid condenser; set of density filters; ribbon-filament research type lamp with transformer. Also the following Zeiss equipment:

1 # 12 12 10 tube slide
4 # 12 12 11 objective slides
1 # 12 14 13 case for three objective slides.

All the above is in A-1 condition. Am advised by the manufacturers that this equipment purchased today would cost $1980. Will sell for 20% off or $1564 net, which should interest anyone who wants the finest equipment. Reason for selling is my present need for equipment in fields other than photomicrography. Write to Ralph J. Schlosser, Urology Department, St. Vincent's Hospital, Box 743, Erie, Pa.